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THE HORSELESS AGE.

A MONTHLY JOURNAL

PUBLISHED IN THE INTERESTS OF THE MOTOR VEHICLE INDUSTRY.

VOLUME ONE. NUMBER ONE.

A COMPILATION,

SHOWING THE

MOTOR VEHICLES, VEHICLE MOTORS AND SYSTEMS OF
PROPELLING AND CONTROLLING VEHICLES

BROUGHT OUT IN THE UNITED STATES
IN
1894 AND 1895.

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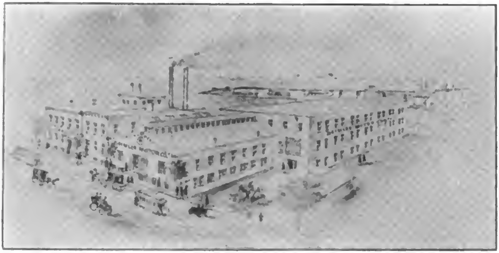

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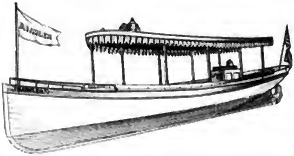

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THE HORSELESS AGE.

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DEVOTED TO THE INTERESTS OF THE MOTOR VEHICLE INDUSTRY.

VOL. I. NEW YORK, NOVEMBER, 1895. No. 1.

THE HORSELESS AGE.

E. P. INGERSOLL, Editor and Proprietor.

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COMMUNICATIONS.—The Editor will be pleased to receive communications on trade topics from any authentic source. The correspondent's name should in all cases be given as an evidence of good faith, but will not be published if specially requested.

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THE HORSELESS AGE, 157-159 William Street, New York.

Salutatory.

WE PRESENT to the trade and the public the first number of the HORSELESS AGE, a journal which will be published monthly hereafter in the interest of the motor vehicle. The appearance of a journal devoted to a branch of industry yet in an embryonic state, may strike some as premature, and the somewhat desultory character of this number may provoke criticism in some quarters. But those who have taken the pains to search below the surface for the great tendencies of the age, know what a giant industry is struggling into being there. All signs point to the motor vehicle as the necessary sequence of methods of locomotion already established and approved. The growing needs of our civilization demand it; the public believe in it, and await with lively interest its practical pplication to the daily business of the world.

In such a condition of expectancy the chief want is news. Not only those directly concerned in the perfection of the new vehicle, but the reading public as well, wish to be informed of the progress of this great mechanical movement; to know the forms or styles in which the new vehicle is to appear, and to examine the claims that are offered, no less than the facts that are accomplished. To satisfy this demand is the work to which the journalist should bend his energies. Criticism, at such a time, may properly be left to the mechanical expert or the intending purchaser. His chosen task is to collect the materials upon which an intelligent judgment may be based.

At this formative period of the motor vehicle industry, exact data are difficult to obtain. All over the country mechanics and inventors are wrestling with the problems of trackless traction. Much of their work is in an unfinished state; many of their theories lack demonstration; but enough has already been achieved to prove absolutely the practicability of the motor vehicle. What is here presented, however, is merely an earnest of what is to come.

The second number of the HORSELESS AGE will contain a detailed account of the *Times-Herald* contest, which is to be held at Chicago on November 2nd, and many new illustrations. In succeeding numbers, topics of importance to the trade will be taken up for discussion. Several projects bearing broadly on the future development of the industry are now under editorial consideration, and will be announced in due time.

◆

The Horseless Age.

It has a fascinating sound, and ere the close of 1895, the idea will have been proved as practical as the sound is fascinating.

It is often said that a civilization may be measured by its facilities of locomotion. If this is true, as seems abundantly proved by present facts and the testimony of history, the new civilization that is rolling in with the horseless carriage will be a higher civilization than the one we now enjoy.

190474

Steam and street railroads have each in their turn given impetus to progress, but they are in their nature monopolies, and their usefulness is limited by the narrow tracks on which they run. They are the great main arteries of traffic, which as civilization advances require to be supplemented by an increasing number of tributaries or feeders. The life of the individual becomes more active, time more precious, and facilities of travel and transportation must be multiplied and distributed to meet the new conditions. One of these subordinate methods of locomotion, the bicycle, has already taken a high place in public esteem as a time-saver and health-giver, but the public appetite for wheeled contrivances seems to be only whetted by what has already been achieved. The people will be satisfied with nothing short of superfluity. A clamor rises for the motor wagon, and presto!—the motor wagon comes. In what amazing variety of form and mechanical application it has come, this volume will clearly indicate.

Until the year 1895 few American inventors devoted any attention to the problem of the mechanical propulsion of vehicles, and the results of their labors were generally crude and impractical. The complicated and unwieldly creations of these pioneers lie among the archives of the Patent Office undisturbed save when some searcher of the present day happens upon them in the course of his investigation, and views them with something of the same interest a scientist has for the petrified remains of an extinct species. The stimulus of a wide spread public interest was lacking then. The few inventors whose ideas assumed a more practical form were forced to curb their impatience, and wait until the public should manifest a livelier curiosity.

Fortunately that time was not long delayed. The change in public sentiment from indifference to enthusiasm was to occur in an incredibly short period of time. The first race for motor vehicles from Paris to Rouen, which occurred in June, 1894, set more of our inventive minds at work upon the motor problem, but it brought forth no general response from the American people. But the race from Paris to Bordeaux and return last June was such a phenomenal performance that all Christendom paused for a moment to fasten its eyes upon the flying automobiles. 750 miles in 48 hours and 53 minutes! The self-propelled vehicle was then an accomplished fact. The mechanical world immediately began to discuss it. The newspapers printed the story of the achievement and sent it into every hamlet, and inventors girded up their loins and buckled with energy to the task of completing the work which in many respects, it was admitted, the foreign engineers had failed to carry to a satisfactory conclusion.

Then the American people seemed to awake with a start to the importance of the motor vehicle. Where one inventor had been interested, a hundred now undertook to master the difficulties. The Chicago Times-Herald's offer of prizes to be competed for at Chicago on November 2nd gave a great impetus to the movement. The spectacle was presented of scores of inventors straining every nerve to finish their wagons in time to participate in the first motor vehicle race ever organized in America.

All these influences combined to bring the motor vehicle to the front more rapidly than any other mechanical improvement was ever developed in this or any other country. The Patent Office was glutted with applications for patents on motor vehicles and parts thereof. About September 1st there were on file at Washington over 500 applications on vehicle motors alone. It is scarcely too much to say that there were in course of construction in the United States between July 1st and November 1st, 1895, no less than 300 different types of motor vehicles. Out of such a wealth of ingenuity many practical ideas are sure to come. Methods of propelling vehicles hitherto undreamed of have been brought to light. Foreign methods of power and control have been simplified, and vehicles lightened without any sacrifice of strength. While many lesser improvements will yet be made, the main problem of producing a practical and economical self-propelled road vehicle seems to have been solved. Once more have we fairly earned our title as the mechanics par excellence of the world.

A pleasing prospect it is that rises before us in contemplating this array of horseless vehicles! From the gradual displacement of the horse in business and in pleasure, will come economy of time and practical money-saving. In cities and in towns the noise and clatter of the streets will be reduced, a priceless boon to the tired nerves of this overwrought generation. Then there is a humanitarian aspect of the case. To spare the obedient beast, that since the dawn of history has been man's drudge, from further service at the industrial treadmill, will be a downright mercy. On sanitary grounds too the banishing of horses from our city streets will be a blessing. Streets will be cleaner, jams and blockades less likely to occur, and accidents less frequent, for the horse is not so manageable as a mechanical vehicle.

An illustrated catalogue of the different vehicles built or projected here this fall will surely be a valuable compilation, and this is what has been undertaken in this volume. Not quite all the motor vehicles constructed or now in process of construction will be found within these pages, but a large portion of them are here described.

Imperfect as the record is it recapitulates one of the most memorable chapters in the history of American invention.

The reader is requested to remember that in a compilation of this character it is the inventor or promoter who speaks, and not the Editor.

A Timely Suggestion.

The following letter speaks for itself and should be carefully perused by all who have the interests of the coming vehicle at heart. The columns of the "Horseless Age" will be open for discussion of the proposition therein contained. The editor is an advocate of trade associations of this character, and will be pleased to receive suggestions in regard to the plan of organization from any authentic source.

Detroit, Mich., Oct. 8, 1895.

To the Editor of the "HORSELESS AGE,"
No. 157 William St., New York, N. Y.
Dear Sir:

Realizing the fact we have already a large number of people in this country interested in the coming evolution, the motor vehicle, and in order to pave the way for this vehicle of the future, it is proposed to form a national organization which will have as its object the furtherance of all details connected with this broad subject, and to hold stated meetings where papers can be read and discussions follow as to the respective merits of all points in question.

Such an organization is needed now, and upon its formation would meet with the hearty co-operation of the newspapers, the friends of good roads and the public at large.

It is therefore proposed that such an organization be now formed and have as its name "The American Motor League."

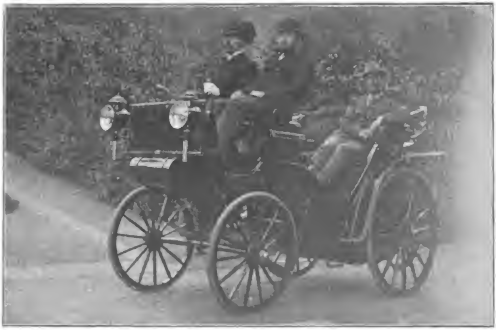
This title is broad, and is well suited to survive any change that the future may bring. Yours truly,

CHARLES B. KING.

Prior to 1888.

Of the gasoline wagons built previous to 1895 one will serve as a type for all. This is the Harris wagon, patented in 1890, and seen on the streets of Baltimore in 1891, (for the inventor did succeed in interesting sufficient capital to build a wagon for exhibition purposes).

In general style it was a park phaeton, but it was a ponderous, complicated contrivance, a huge leviathan of the road, which crushed in the pavements as it passed over them. The gasoline was stored in a large tank in front of the wagon. The motor and controlling apparatus were placed beneath the bed of the vehicle, which had seating capacity for fifteen persons besides the driver. But owing to excessive weight and the complication of its machinery it failed utterly in practice. One weak spot after another developed. The axles became heated, then the gears got out of order. It would move a few blocks and then come to a standstill; the noise of the explosion of the gasoline was suggestive of a railroad locomotive and combustion was so imperfect that the odor filled the street. These objections proved fatal to its success, and it speedily disappeared from view, leaving behind a void in the pocketbook of the sanguine capitalist who had supplied the means to build it.



LATEST MODEL DAIMLER CARRIAGE. DAIMLER MOTOR CO., STEINWAY, L. I.

This wagon was subsequently destroyed by the burning of a building at Washington, D. C., where it was stored.

The same faults were fatal to the practical success of other experimental gasoline wagons built prior to or at this time.

The Daimler Motor.

While traveling in Europe in 1888, Wm. Steinway, the well known piano manufacturer of New York, chanced to hear of the new petroleum motor, which Gottfried Daimler, of Cannstatt, Germany, had recently invented and was then manufacturing.

Mr. Steinway was sufficiently interested in what he had heard to seek an introduction to the inventor. He was well pleased with both the inventor and the invention, and on further investigation, which included a jaunt across the country in a light quadricycle propelled by a Daimler motor, he secured the American rights under the Daimler patents.

On his return to America Mr. Steinway organized the Daimler Motor Company, with factory at Steinway, Long Island, to manufacture Daimler motors for stationary, marine and traction purposes. Since that time large numbers of stationary and marine motors have been turned out at Steinway, necessitating frequent additions to the original plant. The launch branch of the business has been specially prosperous. Daimler Motor Launches are familiar sights in the New York waters, as well as in regions more remote, their reputation for speed, economy and general serviceableness being unsurpassed.

The splendid record made by the Daimler Motor in the Paris-Bordeaux Race last June so stimulated the demand for Daimler carriage motors in America, that a special building adapted to their manufacture is being constructed at Steinway. By the spring of 1896 the company expect to be prepared to supply the demand.

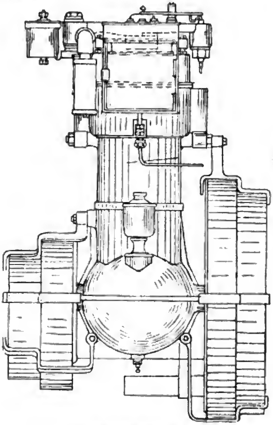
The improved Daimler carriage motor, which they will furnish, is the very latest product of the Cannstatt works, where Mr. Daimler is continually making experiments in the effort to surpass himself.

The motors will be made in two sizes: two horse motors for one seated vehicles and three and one half horse motors for two-seated carriages and delivery wagons. The 3½ horse motors will weigh about 200 pounds and measure 22 x 16 inches.

The Daimler motor is a compact, upright gasoline engine, constructed in three parts—a reservoir containing gasoline, which is used as the fuel; a carburetor, in which the vaporized gasoline is mixed with the gases of the air to produce the explosive mixture, and the cylinder (either one or two, according to the power required).

In the carburetor the air is drawn through the petroleum. Then the mixed vapor passes through a sort of filter which prevents the passage of any liquid. It is then rapidly compressed and exploded in a capsule made red-hot by flame. The motor has a four cycle motion and works with remarkable smoothness.

The cooling of the cylinders (a most important point) is assured by a circulation of water contained in a reservoir of 2,440 cubic inches capacity. This water becomes heated and vaporized, especially during the summer, so that it is necessary to replace it at the rate of from 420 to 600 cubic inches for each hour of running. The gasoline employed has a density of from 0.7 to 0.705, and the mean consumption is about 10 cubic inches to the mile, making the cost of running a carriage about three cents an hour.



DAIMLER CARRIAGE MOTOR.

The carriage illustrated here is the very latest production of the Daimler works. The motor is capable of 4-horse power and the vehicle will carry as many as six persons. Four speeds are provided for:—3½, 6, 9 and 14 miles an hour. By the movement of a lever the carriage backs like any ordinary vehicle.

Grades of 15 per cent can be taken with passengers. Gasoline sufficient for a 20 hour run is carried in the tank.

This is but one of several styles of carriages which the Daimler Motor Co. will soon put upon the American market.

The De La Vergne Refrigerating Machine Co. Hornsby-Akroyd Oil Engine.

The De La Vergne Refrigerating Machine Co., of New York City, have been investigating the motor question for several years with the object of securing a reliable power for the operation of their small ice-making plants, and for the propulsion of vehicles as well, a problem in which they have latterly become interested.

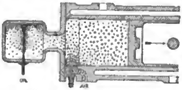


Fig. 1.

After looking over the ground very thoroughly they selected the Hornsby-Akroyd Oil Engine as the best suited to their purpose. This engine which is manufactured by R. Hornsby & Sons of London, England, is claimed to be the most perfect engine of its class now on the market.

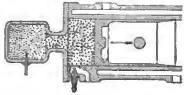


Fig. 2.

It is the only oil engine in existence in which the explosion of the gases is accomplished neither by tube ignition nor electric spark, but is entirely automatic. The automatic explosion itself is not difficult to obtain. The real difficulty is in securing the explosion at the proper time. The manner in which this explosion is obtained in the Hornsby-Akroyd engine is illustrated in Fig. 1. The cylinder, it will be seen, is provided with an extension communicating with the cylinder by

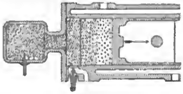


Fig. 3.

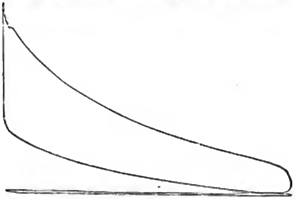


Fig. 4.

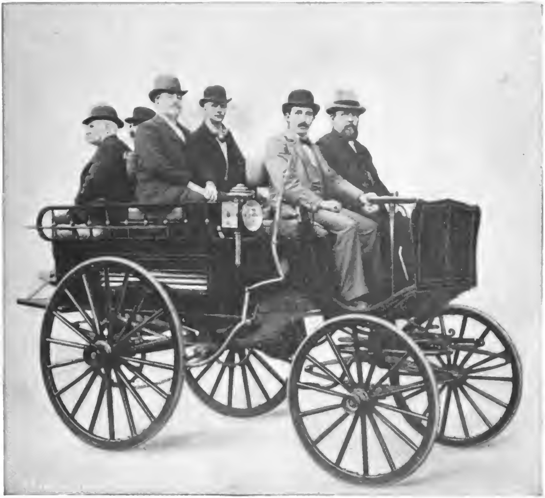
a narrow neck. This extension is unjacketed, and forms a retort in which the oil is vaporized. Nothing but oil in the liquid form is injected into the retort and only air is drawn into the cylinder. The operation which is perfectly clear from the cuts is as follows:

On the outer stroke of the piston the air is drawn into the cylinder and oil is injected into the red hot retort At the end of the stroke, therefore, the retort is filled with oil vapor, which is not explosive, and the cylinder contains pure air which is not explosive, nor is there sufficient leakage from the one to the other to make either of the charges explosive. On the return stroke of the piston the air is forced from the cylinder through the communicating neck into the retort, and the conditions represented in Fig. 2 result; for a time the mixture of oil vapor and air is too rich for explosion, but as the piston progresses sufficient air is forced in to make the mixtures explosive.

Fig. 2 shows the mixing process, and Fig. 3, by the convenient marking, indicates that the explosion has taken place and the cylinder and retort are filled with burned gases. This automatic explosion is found to take place exactly as the piston is making the return stroke and is shown in diagrams similar to those in Fig. 4.

It will be noticed that the ignition takes place within the retort, the piston being protected by a layer of pure air. It is not claimed, of course, that these diagrams are exact representations of what actually takes place within the cylinder, nevertheless their substantial correctness seems to be indicated by the fact that the piston rings do not become clogged with tarry substances as is usually the case with this class of engine. This surplus air should insure complete combustion, and that it is accomplished is evident from the analyses made by Professor Robinson. These analyses indicate that the oil is completely burned in the engine with excess of oxygen. The products of combustion consist mainly of steam and carbonic acid diluted with nitrogen and oxygen, no traces of carbonic oxide being detected, so that the exhaust is not in any way objectionable.

The oil is sent to the retort by a small pump, which always supplies enough for the full power the engine is expected to develop. If less power is being used the speed increases a trifle and a high speed port governor opens a by-pass and allows



MOTOR DRAG. DE LA VERGNE REFRIGERATING MACHINE CO., NEW YORK.

the surplus oil to return to the reservoir which is cast in the base plate.

At the De La Vergne Refrigerating Machine Company's Works a Hornsby-Akroyd oil engine is running some wood working machinery for the pattern shop and is interesting to watch the promptness with which the governor adjusts the quantity of oil to the varying power which is taken off. The power varies from the full capacity of the engine to nothing, half a dozen times within 10 minutes. When running light nearly the whole of the oil is seen to run back. The moment the circular saw is put on the overflow ceases and the engine without any laboring takes hold of the work.

The Hornsby-Akroyd engine has been adapted to a variety of purposes; one of the most interesting is the portable type, the advantages of which are so obvious as to need no comment. The De La Vergne Refrigerating Machine Company has created a special oil engine department under the management of Mr. George Richmond and expects to have ready for the market at an early date some 20 sizes of these engines, up to 40 horse-power.

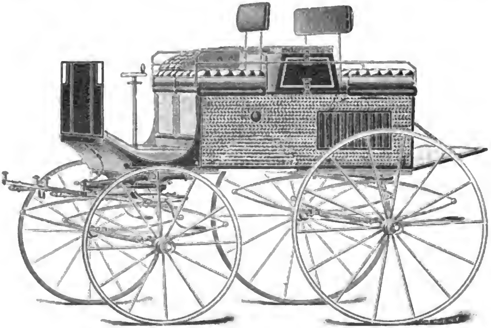
They claim a real advantage in that each size and type of engine has been thoroughly tested and approved by the original builders before being put on the market so that there is no question of experiment.

Messrs. Richard Hornsby & Sons, Limited, thoroughly test every engine before it leaves their works, and no new type is allowed to leave until perfect in every respect. They claim the unusual record of never having an engine returned on their hands. The same conservative policy will be pursued by the De La Vergne Refrigerating Machine Company.

The oil with which the "Hornsby-Akroyd" engine works most efficiently is a cheap mineral oil, weighing about 8½ lbs. per gallon, with a flashing point of from 200° to 220° Fahr. Other and more expensive oils can be used if desired, any of the good mineral lamp oils being suitable, if not less in weight than 8 lbs. per gallon.

In order to start the engine, a lamp is used to externally heat the vaporiser, which can be readily done in from five to seven minutes with the help of a small rotary fan, supplied with, and attached to the engine. The lamp is then extinguished, as there is no further use for it, inasmuch as the required heat in the vaporiser is kept up by the continuous explosions. The engine is kept running by the pump supplying a suitable quantity of oil, the supply being controlled by the action of the governor. Very little attention is then required, beyond replenishing the self-acting lubricators periodically. Full and simple working instructions are sent with each engine, but the simplicity is so perfect that any unskilled person can very readily understand it.

The cost of working of the larger sizes is less than one half-penny per actual or brake horse power per hour, and this is only very slightly exceeded in the smaller sizes. Once started, the engine requires no further attention beyond keeping the tank supplied with oil, and occasionally filling the oil cups.



MOTOR HUNTING TRAP. DE LA VERGNE REFRIGERATING MACHINE CO., NEW YORK.

While the Hornsby-Akroyd engines are being prepared for the market, the De La Vergne Co. are building four motor wagons propelled by regular horizontal gas engines. Two of these may be described as hunting traps, and the other two are drags in somewhat modified form.

The hunting traps, which are of the very newest design, are equipped with single cylinder motors, having two pistons. This novel departure in gas engine construction which is an invention of Mr. Richmond is said to reduce to a minimum the vibration or pulsation experienced in many motor wagons.

The motor makes 350 to 400 revolutions, is capable of 4-horse power and weighs 300 pounds. Carburetor and water tank are both done away with, and a condenser is used, rendering 30 pounds of water sufficient for a run of 10 hours. Cylinder and water jacket are cast in one piece.

The speed is controlled by means of a friction clutch invented by J. C. Bleveney, superintendent of the De La Vergne Works, and said to be superior to all others for this purpose. The motor can be stopped if necessary by turning a lever, and the wagon can be reversed without stopping the engine. So effective is this latter device that it is said the wagon can be stopped within ten feet while going at a fair speed. Any speed from 3 to 25 miles an hour can be obtained. A powerful wagon brake is supplied for use on hills or for sudden stops.

The noise of the exhaust is stifled in a muffler, in which is also placed a condenser that condenses the unburned gas and prevents disagreeable odors.

No belts are used anywhere in the machinery, which is fitted with ball bearings at crucial points to reduce friction as far as possible.

Sprocket and chain transmit the power from the shaft to the wheels, the tension of the chain being regulated by a set screw.

The steering wheels are pivoted at the hub. The steering rod runs up to to the seat on either the right or left side of the operator. A small equalizing spring at the base of the steering rod serves to hold the steering connections in place and keep the lever steady in the hand of the conductor.

The explosion is produced by an electric spark, the battery being stored under the front seat, where is also to be found a full kit of tools for temporary repairs.

The gasolene tank, which is placed under the front seat, holds enough for a three days run. The cost of running is about one half a cent an hour for each horse power.

The weight of the traps is 1,500 pounds each and they have a seating capacity for four with abundant room for baggage and hunting equipment. They were built specially for rough use on all kinds of roads by Hincks & Johnson, of Bridgeport, Ct.

The two drags are slightly heavier, weighing 1,800 pounds each, and having three seats, accommodate 6 or even 8 persons.

The motor is a two-cylinder, 4-horse engine, weighing 375 pounds. The two cylinders are balanced so that vibration is noticeable only when standing still.

A carbureter is used to prepare the gas, which is then thrown into the cylinder by a suction valve, compressed and ignited by an electric spark.

The cylinders are cooled by water jackets connected with a tank of 250 pounds capacity, lasting for a 6 hour run. Cylinder and water jacket are cast in one piece.

These wagons have the ordinary fifth wheel though the steering wheels are pivoted at the hub as in the hunting traps. They were built for park use and summer touring by Valentine Linn & Son, carriage builders, Brooklyn, N. Y.

The lamps on all these wagons are lighted by electricity generated by the motor, and the wheels which are respectively 36 and 48 inches, are fitted with the solid rubber tires of the Rubber Tire Wheel Co.

The De La Vergne motor and gearing are built in an iron frame, around which the wagon or carriage maker constructs his vehicle. This frame can easily be used for any style of vehicle.

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Hill's Locomotor.

One of the most interesting vehicles brought out in the United States this fall is Hill's Locomotor, entered in the Race by Hill & Cummins, 232 S. Clinton St., Chicago, Ill. This vehicle falls into the gasoline classification, but exhibits many original and ingenious features.

In design the vehicle is a canopy-top surrey with two seats. The tires are Morgan & Wright pneumatic and ball bearings are used on the axles and in the journals of the motor. The gear is made of two inch boiler tubing, and is very light and strong.

In the motor novel features abound. It has two cylinders, 4 x 5 inch stroke, and all parts are compensating so that perfect balance is secured, and vibration done away with. Around the cylinders which are of aluminum bronze, are thin circular ribs also of aluminum bronze and somewhat resembling a pine cone. This new alloy gives extreme lightness with strength, and the ribs serve as radiators of the heat from the cylinders, the radiators being accelerated by the spokes of the fly wheel, which closely resemble the blades of an exhaust fan, and draw the air around the radiating ribs as the wheel revolves. In this manner the cylinders are kept cool without the use of a water jacket. The fly wheel weighs about 60 pounds, is 14 inches in diameter, and is placed between the engine and the speed-regulating device at the end of the shaft.

The exhaust passes into the tubular frame work of the wagon and is dissipated through a number of small perforations therein, the noise being completely smothered before the vapor reaches the air.

Although no water is needed to cool the cylinders about one pint is required for the governor of the motor which is a small rotary pump, weighing only a few ounces, fastened direct to the engine shaft. A flexible tube passes from the pump to the handle bar in front of the operator of the carriage, and returns again to the pump. At the handle bar is an ordinary valve, and on the pump is a small flexible diaphragm in contact with water. The water circulates through the flexible tube past the valve. The amount of pressure generated in the circuit determines the height to which the diaphragm will rise. When the engine is running at normal speed the resistance to the circulation of the water is such that it reduces the number of explosions. All that is necessary to change the speed of the engine, therefore, is to change the opening of the valve at the handle bar. This the operator can instantly do, thus keeping the engine always under immediate control. In summer water is used in the tube, but in winter a non-freezing liquid is substituted.

At 700 revolutions the motor generates 6 horse power rendering possible a speed of 28 miles an hour. Even higher speed can be attained.

Perfect combustion is obtained by positive division, so that no more of it than is required for perfect combustion can enter the cylinder. Consequently there is no disagreeable odor from the exhaust.

Speed is regulated by a friction device of new conception. One face of a friction disc has often been used for this purpose before, but in the Hill Locomotor we have both back and front used, reversing being also accomplished by the same disc. There are three small 4 inch discs, two for regulating speed and one at the extreme end of the shaft for reversing. The main friction disc, which is at right angles to these is 14 inches in diameter, and ¼ inch thick. The large disc is of hardened steel, the small ones of indurated fibre.

In starting the carriage the operator draws back the steering lever slightly, causing the friction to engage for forward locomotion. The lowest regular speed is 3½ miles an hour but much lower speed is possible if the handle is not pushed enough to take the full grip, as in the cable grip with which all are familiar. On pushing further the frictions engage more closely, and the working circle of the main disc is decreased. When the handle bar is brought near to the operator the highest speed is attained, without a change in the speed of the motor.

The vehicle is stopped by throwing the lever forward to the limit of its stroke, and if required to reverse suddenly, the operator simply pushes forward, which brings the reversing disc at the extreme end of shaft in contact with the edge of the main disc. In this way the vehicle can be reversed much quicker than an engineer can reverse a locomotive.

There are only two pairs of running gears about the whole machine, and these are made of steel and aluminum bronze, so that no noise is perceptible in their operation.

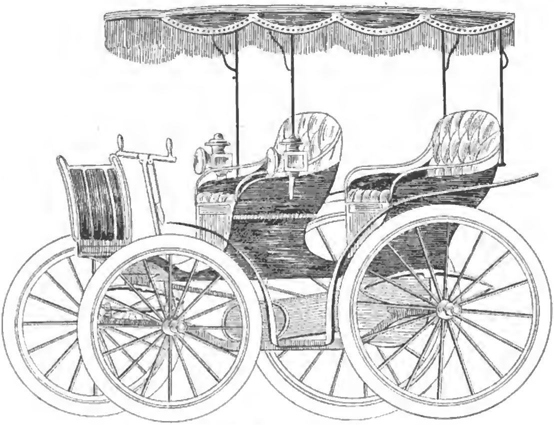
machinery is encased in sheet iron and leather, the latter being employed to deaden sound.

The gasoline tanks (two are used to obviate bulkiness), are placed on each side of the transmitting gear. Together they hold 12 gallons, enough to last for a journey of 200 miles.

The battery furnishing the electric spark is disposed of in a suitable receptacle in the vehicle.

Mr. C. C. Hill the inventor of this vehicle and many other practical inventions, has studied on the problem of trackless locomotion for four years.

Hill & Cummins state that their two-seated vehicles can be sold for about $500, and one-seated for $350.



HILL'S LOCOMOTOR. HILL & CUMMINS, CHICAGO, ILL.

To avoid the use of oil and hence allow the motor to work hot when it is more economical, metaline rings are used in the cylinders.

To prevent leakage during compression only one valve enters the cylinders.

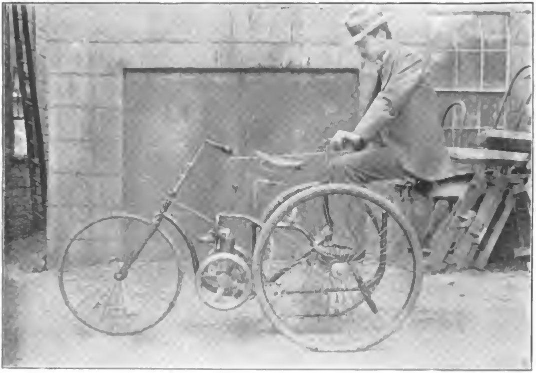
The object of the inventor in designing this vehicle was to obtain a gear and motor complete and in one, so that boxes of different design could be placed upon it without difficulty. A pleasure carriage can thus be transferred into a business wagon by merely leaving on the gear the springs of the pleasure wagon, making six springs for the business wagon and three for the pleasure vehicle.

The weight of gear and motor combined is about 225 pounds, and that of the vehicle complete about 600 pounds. All the

The Maxim Motor Tricycle.

Hiram Percy Maxim, of Hyde Park, Mass., son of Hiram S. Maxim, the well known inventor of the Maxim gun and the flying machine, has been engaged for some time past in perfecting a motor tricycle. It is a Columbia Tandem fitted with pneumatic tires. The motor, mounted just in front of the forward saddle, weighs 32 pounds without the fly-wheels. The speed-governing valve is within easy reach of the occupant of the rear saddle. A switch, governing the igniting current is placed on one of the handle-bars for quick stops or sudden slow ups. The battery furnishing the current for the electric igniter is under the rear saddle. There are nine cells of chloride of silver batteries, which weigh about 12 ounces, and an ordinary gas lighting spark coil is used to intensify the spark.

The motor is a three cylinder Otto cycle engine, leaving only one-sixth of the revolution as dead space. The compression previous to ignition is not as high as in water jacketed engines of this type but the heat is correspondingly less, and by making the cylinders of the very finest quality of cold drawn seamless steel tubing, and very thin, no difficulty is found in lubricating the pistons. The cylinders are 1-16 of an inch thick; all bolts, cranks, crank shafts and pins are hollow and oil-toughened, and the entire machine is of the best possible construction, to obtain strength and light weight. The power is said to be approximately 1 and ½ horse power. There are but two external working parts, which obviates trouble with dust and grit.



MOTOR TRICYCLE. HIRAM PERCY MAXIM, HYDE PARK, MASS.

Under one of the lower stay tubes of the tricycle frame, is the gasolene tank, which holds enough for a run of about 60 miles.

The machine was built to obtain data for the construction of a standard self-propelled tricycle, for pleasure riding, doctor's use, and in special cases, for pace making. It was intended for one person, but two can ride if desired. In Mr. Maxim's opinion it thoroughly demonstrates the fact that a motor tricycle can be constructed that will weigh not over 100 pounds.

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The Sprague Motor Vehicles.

H. A. Sprague, of Fowlerville, Mich., is preparing to build both two and four-wheeled vehicles, in which the most approved methods will be used to secure lightness, strength and the reduction of friction in both motor and vehicle.

The motor employed will be of the Otto cycle type, using gasolene direct from the tank.

The speed of the four-wheeled vehicles will be changed by a change in the speed of the engine within certain limits, though this will also be assisted by gearing. Alternate gears of rawhide will be used to reduce noise.

In the two-wheeled vehicles speed will be regulated by that of the engine only, and the motor will be connected directly with the main wheel. Two cylinders will be used, without water jackets, and no pedals or sprockets will be required.

The diameter of the wheels will be small, and the diameter of the pneumatic tire, large.

The Pierce Steam Tricycle.

W. A. Pierce, of Sistersville, W. Va., is building a steam tricycle with boiler and two horse power engine, which will weigh altogether about 360 pounds.

He states that he uses crude oil for fuel, and can raise 150 pounds of steam in four minutes.

The frame of the vehicle is made of iron pipe one inch in diameter. The wheels are of wood.

A galvanized iron tank serves as a reservoir for the 15 gallons of water and 5 gallons of oil, which are taken at the start.

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The Tower Gasolene Bicycle.

Clinton A. Tower, of 712 Giddings Ave., Cleveland, O., has obtained a patent on a motor bicycle, and constructed one machine for his own use. He states that he can make 30 miles an hour on good roads, and that one quart of gasoline is sufficient for a 5 mile run. The number of Mr. Tower's patent is 535,605.

The Elrick Gasolene Vehicle.

George Elrick, of 904 Irving Street, Joliet, Ill., is constructing a four-wheeled motor vehicle which he states will weigh less than 100 pounds. The weight of the gasolene motor he estimates at 20 pounds, that of the steering gear at only one pound and a half.

The vehicle will carry two persons, and the cost of running will be only ten cents for each hundred miles. Mr. Elrick states that the engine has no wheels or gearing about it, makes its own gas and that no electric battery ie required to produce the explosion.

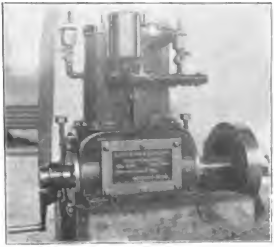
The Pole Gas-Motor System.

The National Capitol Street Car Motor Co., of Washington, D. C., who are introducing their Pole system in Philadelphia, New York and Boston for the independent propulsion of street cars, are also planning to adapt it to motor wagons. The system is said to be based on the storage of city gas under pressure.

King's Gas Engines.

Charles B. King, manufacturer of "King's Valveless Pneumatic Tools," 112 & 114 St. Antonie St., Detroit, Mich., is preparing to place on the market two different types of gas motors specially designed for vehicles, launches and general light power purposes.

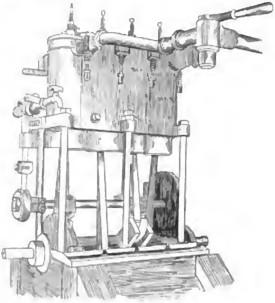
The first is an upright enclosed crank case engine, which runs on a new cycle of Mr. King's invention. It has two cylinders, the water jacket being cast in the same piece with them. There is an explosion every stroke from each cylinder, making two explosions each revolution. The capacity of the engine is 3 H. P. and the weight about 200 pounds.



3 H. P. ENCLOSED CRANK CASE ENGINE.

The fuel used is gasoline, and the cost of running is about 1 cent per hour for each horse power. While the engine is built for durability and hard service, the high finish of the parts is no less noteworthy.

The other motor is a 4-cylinder open frame engine, weighing about 130 pounds, fly wheel included, and giving 4 H. P. at the brake. In this also the water jacket is cast in the same piece with the cylinders. As it is only 18 inches high it can be placed under the seat of a vehicle, and need necessitate no change in construction.



4 H. P. OPEN FRAME ENGINE.

Some of the features of this engine are entirely new, and will be described later.

Mr. King is building a two-seated carriage to weigh about 900 pounds complete. It will be fitted with single tube pneumatic tires and ball bearings.

The Schilling Gasolene Tricycle.

About a year and a half ago A. Schilling & Sons, manufacturers of the Golden Gate Gas Engine, 211 Main St., San Francisco, Cal., built for a resident of Santa Maria, in that state, a tricycle propelled by a two horse power Golden Gate Gas Engine of balanced construction. A 12 hours supply of gasoline is carried and a speed of 10 to 12 miles an hour is attained. Two persons could ride and the engine was placed in front of the seat in full view.

To make Motor Cycles at New London, O.

The New London Specialty Company, New London, Huron Co., O., have about perfected a petroleum bicycle, which they will manufacture for the '96 trade.

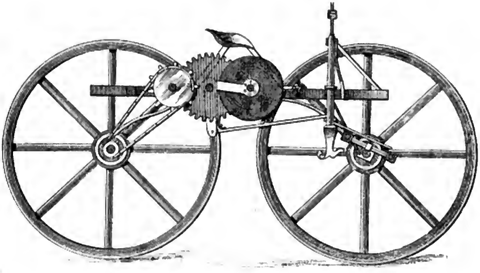
Among its new features will be a frame of special design, which it is thought will prove superior to the present one for motor use.

The Lybe Spring Motor.

D. I. Lybe, of Sidney, Iowa, is the inventor of a spring motor for two or four-wheeled vehicles, which is said to store up power while the vehicle is going down hill, and to utilize it on a level or up grade. Both arm and foot power are employed, and the assisting mechanism is said to be so constructed that it is also available for propelling boats, the change from vehicle to boat occupying less than five minutes.

Mr. Lybe states that his device for a four-wheeled vehicle weighs less than 100 pounds and costs only about $120. On level ground it is said to be capable of running 2,000 feet itself, and a maximum speed of 30 miles an hour is said to be attained both on land and water.

The inventor thinks his machine will afford a mild and pleasing form of exercise, in addition to its speed advantages.



SPRING MOTOR D. I. LYBE, SIDNEY, IOWA.

Otis E. Smith's Spring Motor.

Otis E. Smith, of Hartford, Conn., was unable to complete his vehicle in time to compete in the Chicago Race. It will be a light vehicle of the bicycle variety. The power is derived from a number of compressed spiral springs, which exert their force directly upon the rear axle.

The springs, he states, will need no winding, as they are compressed when placed on the vehicle, and are operated by another heavy coil spring, "which is wound up and in unwinding sets in motion mechanism that causes the spiral springs to push and pull on a crank, thus causing a rotary motion."

Mr. Smith hopes to make 15 miles on one winding, and to be able to wind his spring motor up with a dozen turns of a lever.

Remington Arms Co. Interested.

The Remington Arms Co. are reported to be experimenting with a kerosene motor, which they will soon apply to their bicycles, and also put on the market a line of motor tricycles.

Ernst Power Vehicle Company.

Victor H. Ernst, a well known inventor in the horological, typewriter and steam engine lines, and Vincent F. Lake, who has spent ten years in perfecting an improved type-setting machine which sets up and justifies a whole column at a time, instead of a line, have associated themselves together in experimental work and will soon bring out a motor vehicle, embodying many original ideas.

Like others they are striving for lightness, simplicity, compactness and low cost and claim to have succeeded in securing all these desiderata in high degree.

They are building three different types of motors, a steam, a petroleum and an entirely new class of engine, the identity of which they are not ready to reveal. These motors will be thoroughly tested, and the one which gives the best results will be finally adopted. They state that they have already developed 2 horse-power from a steam engine, weighing only 13 pounds and 13 x 5½ inches in size, which requires no boiler, and illustrates an entirely new and valuable principle applicable to all steam engines of whatever size. A still smaller engine of Mr. Lake's invention is also to be utilized.

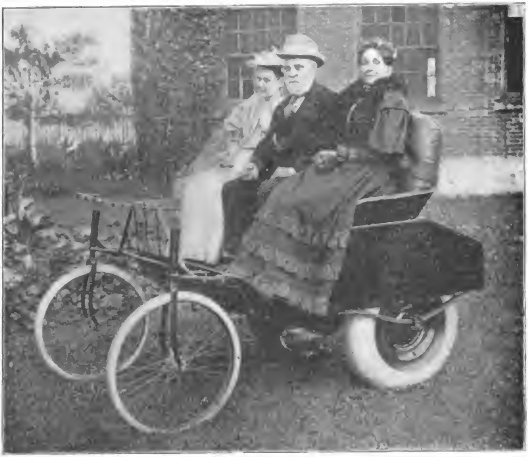
Vehicle motors will be built from 2 horse up to 10 and 12 horse power, and in the carriage construction a new alloy of aluminum and titanium will be employed, which gives two thirds of the strength of steel and almost the same specific gravity as aluminum.

Both Mr. Ernst and Mr. Lake are able inventors. Both have given years of study to the motor vehicle and are therefore fully equipped to grapple with the difficulties involved. Mr. Ernst is said to have evolved twenty-two different theories of propelling vehicles, all of which he has worked out in detail. The Ernst Power Vehicle Co., which has been organized to perfect and manufacture these inventions, has a temporary office at 245 Broadway, New York. Vincent F. Lake is president, Victor H. Ernst, vice-president and superintendent, and E. V. Machette, secretary and treasurer. They expect to be prepared to demonstrate their claims early in 1896.

The J. B. West Gasolene Vehicle.

J. B. West, of 105 Meigs St., Rochester, N. Y., the inventor of the power tire setter, has given much attention to the motor vehicle for nearly twenty years. He has completed a one-seated vehicle which exhibits a number of highly novel features.

The drive wheels are 30 inches in diameter and are fitted with 6¼ inch Dunlop tires. No spokes are used in these wheels, a web of steel plates being substituted. Each will carry a load of a ton.



GASOLENE VEHICLE. J. B. WEST, ROCHESTER, N. Y.

The steering lever is similar to that used on ordinary tricycles, but is connected with both front wheels, which are of bicycle build and are fitted with pneumatic tires of ordinary size.

The motor which is of Mr. West's own invention and manufacture, weighs only 135 pounds and is said to develop six horse power. Patents have been applied for on certain of its features.

The weight of the vehicle is 600 pounds, and the inventor believes that it is equal to a speed of 30 miles an hour on a level track.

MacKenzie & McArthur's Compressed Air System.

MacKenzie & McArthur, machinists of 65 Orange St., New Haven, Conn., have been experimenting in vehicle motors for about three years. Gasolene, kerosene and other motors have received considerable attention from them. At present, however, they are working on a compressed air system, which they believe offers many advantages. They propose, while the vehicle is in motion, to pump air into a tank under a pressure of about 300 pounds, and then carry it to a pair of compound engines of the marine type, weighing about 50 pounds apiece. The engines will be geared direct to the axle.

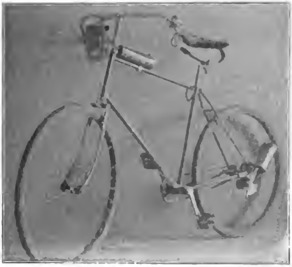
The pump on which they are now experimenting is similar in principle to the Rider Hot Air Engine, working by expansion and contraction.

They are planning to build delivery wagons weighing only about 800 pounds, steered at the hub, and operated by two levers, one for steering, the other for regulating and reversing.

The Riotte Kerosene Bicycle.

C. C. Riotte, of the Riotte & Hadden Mfg. Co., 462 East 136th St., New York, has invented a kerosene motor for bicycles, which is extremely simple, light and inexpensive. It can be attached to any ordinary bicycle, detached at a moment's notice, and is started and stopped by a small handle at the oil tank. It consists of two small valves, a cylinder, piston and igniter.

The operation of the motor it as follows: When the piston descends, a cylinder full of air mixed with a small quantity of kerosene oil is compressed into the explosive chamber and there ignited by an electric spark which is generated from a small battery weighing one half pound. This battery never polarizes or requires recharging.



KEROSENE BICYCLE. C. C. RIOTTE, NEW YORK.

The air in the cylinder being highly heated from the combustion of oil drives forward the piston which is connected through a crank with the rear wheel as seen in the illustration. The operation continues on, almost noiseless and without smell, with every turn of the rear wheel. A speed of twenty five miles per hour has been attained with it on level ground and a pretty good speed maintained on grades of about four or five per cent.

The weight of the motor including tank full of oil is nine and one half pounds. The tank holds enough oil to carry a person 75 miles and when the oil gives out a quart of kerosene or any kind of petroleum lamp oil can be bought at any country store or of any farmer.

Mr. Riotte has been experimenting in gas and oil engines all his life, and has had a good deal to do with stationary and marine engines of all descriptions.

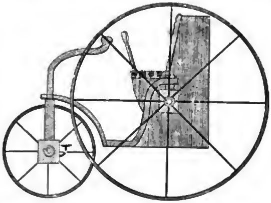
The principle of this bicycle motor is the same as that of his new improved stationary oil engines except that heavy weights and the fly wheel are dispensed with.

This firm is also constructing a carriage, which is propelled by a kerosene motor the same in principle as their stationary motors. The operating gear will have but one lever to start, stop, reverse or go at any speed from 2 to 25 miles per hour, They expect to form a company to manufacture bicycle and carriage motors on a large scale.

The Holmes Gasolene Tricycle.

Lyman S. Holmes, of Gloversville, N. Y., is constructing a gasolene tricycle to seat two persons.

The motor he describes as a 3-horse power gas engine. The total weight of the motor is about 200 pounds. The speed attained is from 10 to 20 miles an hour, and one lever starts, stops, regulates speed, reverses, applies the emergency brake and guides the vehicle.



GASOLENE TRICYCLE. L. S. HOLMES, GLOVERSVILLE, N. Y.

The motor, which is on the rotary principle, is of the explosion type, ignition being effected by means of an electric spark.

The hind wheels of the vehicle are six feet in diameter, and the front wheel is three feet. All three wheels are fitted with cushion tires.

The weight of the vehicle complete is about 300 pounds, and it will carry two adults.

The Conklin Electric Tricycle.

Oliver F. Conklin, of Dayton, O., has an electric tricycle which he believes is built on strictly scientific principles for durability, comfort and every day business and pleasure use.

The weight of the machine complete, without motor or batteries, is 47 pounds; with motor and batteries, 160 pounds. The seat is 32 degrees between arms, and the whole machine is designed for a maximum load of 500 pounds, riders and baggage. It has tubular steel frame, brown wire-bound wood rims, pneumatic tires and oak battery case. The battery case and motor are spring-mounted, and the seat is of leather, hammock style.

M. B. Mills Storage System.

M. B. Mills, 125 La Salle St., Chicago, Ill., a well known inventor in the pneumatic line, enters in the *Times-Herald* Race a vehicle propelled by compressed air or gas. The vehicle which is somewhat like a dog-cart in style has three wheels and is of bicycle build throughout, all the wheels being forked, the frame of tubular steel and the tires pneumatic. Its weight is about 150 pounds.

The tank in which the compressed air or gas is stored, is made of aluminum and the inventor expects to recharge it only once during the entire race course of 100 miles.

No fly wheels are used in this power system, and the steering is accomplished from the front seat very much as in the bicycle. In the braking mechanism new features appear.

The vehicle has two seats, a front one for the operator, and a rear one for two.

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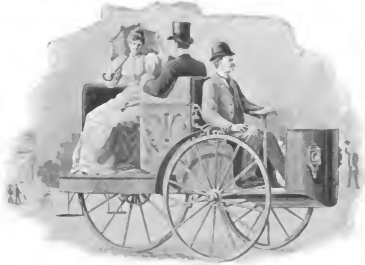
The Salisbury Motocycle.

This is one of the most novel motor vehicles yet designed. The inventor states that he has adopted this form of construction in order to eliminate the chain and sprocket and get direct gearing from the engine to the beveled wheel, which is the driving wheel of the vehicle. The reason assigned for the choice of three wheels instead of four, is that it secures a direct and central action, which is also central with the weight carried.

The engine which is encased in the dashboard, is a double cylinder double acting engine, producing an explosion every revolution. Its weight is said to be less than 150 pounds, and its capacity from 5 to 7 horse.



THE SALISBURY MOTOCYCLE. W. I. SALISBURY, CHICAGO, ILL.

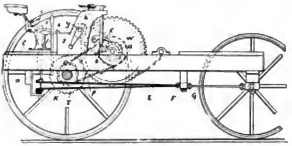
The two forward wheels are guiding wheels, pivoted at the hub. All three wheels are 48 inches in diameter, are constructed of wood bound with steel and brass, and are fitted with Columbia pneumatic tires.

This vehicle weighs about 600 pounds, has four speeds, 3, 7, 14 and 21 miles an hour, and a double brake, foot and hand. It is designed to carry three or five persons. The cost of operating is about the same as in other gasolene carriages.

The Horseless Carriage Co., which has been organized to manufacture the Wilbur I. Salisbury vehicles, will build them with and without tops, and will make a specialty of light tricycles which by a change of box, can be used for either business or pleasure. The company's address is 1616 Masonic Temple, Chicago.

The Burdick Spring Motor.

A. Burdick, of Hubbell, Neb., has devised a spring motor for vehicles. Any suitable wagon box can be used, and any number of springs, according to the power desired. The springs can be wound in three ways, namely: by the momentum of the vehicle in going down hill, by hand, or by a small electric battery of about one man power.



SPRING MOTOR. A. BURDICK, HUBBELL, NEB.

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The Bundy Wagon.

W. L. Bundy, superintendent of the Bundy Co., Binghamton, N. Y., has just completed a steam wagon for his own use only.

In shape, the vehicle closely resembles an ordinary democrat wagon, with the engine and boiler placed just forward of the rear wheels.

The engine, of the upright pattern, is capable of six hundred revolutions a minute. It exhausts into the water tank where there is a muffling arrangement that shuts off all noise. The fuel is kerosene, a jet of steam serving to blow a spray of this liquid against the boiler, where it takes fire. As soon as the steam pressure rises above a certain point an automatic arrangement shuts off the fire, and when the pressure falls the fire is lighted again automatically.

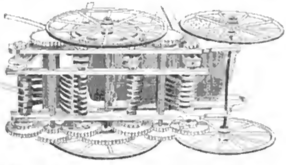
Motion is communicated to the machine through the rear wheels, which are fastened to the revolving axle and connected with the engine by cogs, sprockets and chain. There are two chains and two sets of sprocket wheels so arranged that by the single movement of a lever the machine can be made to go fast or slow without changing the speed of the engine. The fast speed is used on levels, and when a hill is reached the fast gear is thrown off and the other used. This decreases the speed one-half but gives double power for hill-climbing.

The steering apparatus is connected with the front axle by a worm gear. The machine moves forward or backward, and is equipped with three sets of brakes and a whistle. Seats are arranged along the sides and are sheltered by a canopy top. The wheels are of wood. The whole complete, weighs nearly fifteen hundred pounds, makes ten miles an hour over country roads and hauls a load of two tons on good roads.

The Andrews Spring Motor.

A. B. Andrews, Center Point, Iowa, has recently applied for a patent on a spring motor for vehicles. The first model which he constructed, a baby carriage, is herewith illustrated.

The device which Mr. Andrews states can be applied to any vehicle, is attached under the hind axle, one piece on each side. These pieces for a wagon are 6 feet in length. At each end are two main driving shafts which mesh with cog wheels.



SPRING MOTOR. A B ANDREWS, CENTER POINT, IOWA.

The springs are wound with levers. By throwing on the winding gear the mechanism will wind itself up while going down hill, or by setting it into combination it will wind itself up. It winds up six times as fast as it runs down. The amount of power which Mr. Andrews says he secures is six horse, 2½ horse to wind up, and 2½ horse to draw the load. There is one spring to wind all the time, and five to wind one up and pull the load.

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The S. H. Roper Steam Vehicles.

The Nestor of steam road vehicle inventors in this country is Stephen H. Roper, of 299 Eustis St., Roxbury, Mass., a well known authority on the steam engine. Mr. Roper has furnished engines for many of the fastest steam yachts in Boston Harbor, and incidentally for thirty-five years, has experimented to reduce the weight and increase the efficiency of the steam engine for road vehicles. Since 1860 he has built no less than ten vehicles, two, three and four-wheeled. The first four-wheeler which he constructed weighed about 800 pounds and the last, completed in 1894 and sold to William Homes of Fisk, Homes & Co., fire-brick manufacturers of Devonshire St., Boston, weighed only about 325 pounds.

The carriage was purchased by Mr. Homes that he might experiment in the direction of applying naphtha as a fuel in place of coal which Mr. Roper formerly used. This was carried to a point which demonstrated that with four burners steam could readily be made to supply the engines, but six were introduced in place of four thus insuring ample supply. The carriage is not quite complete, as it stands at present. The only thing remaining to be done is to make and attach the naphtha tanks. Some little work also is to be done on the woodwork of the body. It has seating capacity for two persons back to back.

The machinery, engines, boiler, etc., are beautifully constructed. The boiler is 10 in. diameter, 20 in. high with 70½ inch tubes. The engines are double with cylinders 2 x 4 in. geared four to one. This carriage with coal fuel made a mile on the Mystic track in two minutes, fourteen seconds, and Mr. Roper frequently made runs of thirty miles in an afternoon. It climbs grades with ease and is regarded by its owner as the most successful steam vehicle ever constructed.

Owing to lack of time and business arrangements which prevent, the owner cannot carry the work further and now offers to sell the vehicle.

Mr. Roper's first steam bicycle was built about 1870, while a bicycle which he is now building weighs only 70 pounds, including fuel and water, and will make a mile a minute if the throttle is opened wide enough.

The bicycle, to which the engine has been attached, is a Columbia of the standard pattern. The boiler, set perpendicular in the frame, measures 16x6x6 inches, with a four inch compartment above from which a long smoke stack, about 2 inches in diameter extends to the rear of the saddle. The corners of the boiler are rounded.

The engine which is of the marine type, is firmly attached to the side of the boiler and the connecting rod is attached directly to the hind axle without any chain or gear whatever. The greatest nicety is required in placing the engine to avoid all unnecessary friction.

The water is carried in a long circular tank fastened to the top of the frame, which contains just one gallon of water, or sufficient to last for a journey of eight miles.

The fuel used is powdered coke or charcoal, gasolene or kerosene. So perfect is the combustion that very little smoke is emitted from the pipe.

Speed is regulated by means of a damper controlling the fire, and a throttle, controlling the steam supply. These are both operated by means of cords reaching to the handle bar.

The delicate adjustment of the parts is shown by the fact that the engine will run under two pounds of steam, and a speed of 2,000 revolutions is attainable.

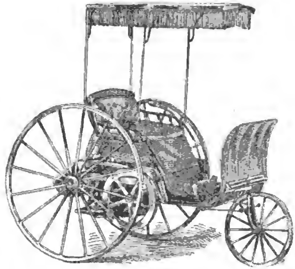
Mr. Roper has for years been a martyr to the cause which is now just beginning to receive the popular approval it deserves. Time and again has he been reviled and abused, threatened with personal violence and even arrested for guiding his self-propelling vehicles through the streets of Roxbury and Boston. In every case where he was brought before the bar the authorities found that he had disobeyed no law, and they had no right to arrest him. But the case was no sooner disposed than some other blundering Dogberry would assume that any man who was singular enough to ride in a horseless vehicle must be a law breaker, and again the determined inventor would be brought before a magistrate.

Mr. Roper relates one instance of blindness in the powers that be, which borders on the humorous. An alderman of Boston, who happened to see him riding in his steam vehicle shouted at him that he had no right to bring such a machine as that into the street to frighten horses. Mr. Roper replied that there was no law against it. The alderman then vowed that if there was none there should be one inside of twenty-four hours, and the next day he railroaded an ordinance through the Board, prohibiting such vehicles from the use of the streets. The comic side of the incident lies in the fact that a short time before this the board had appropriated $5,000 to be applied on experiments looking toward the perfecting of a self-propelled steam fire engine. A member of the Board who had a saving sense of humor pointed out this inconsistency to his colleagues, and the foolish ordinance was repealed.

After all these years of experiment and persecution Mr. Roper now has the satisfaction of seeing his patience rewarded by the dawn of The Horseless Age.

The Buckeye Gasolene Buggy.

Some time ago the Buckeye Mfg. Co., Anderson, Ind., manufacturers of the Lambert gas engines, constructed the three-wheeled motor buggy, herewith illustrated. The motor, which was a Lambert gasolene engine, was placed under the seat, as also was the receiving tank, which stored sufficient gasolene for a 100 mile run. A small quantity of water was carried to cool the cylinder, and the explosion was effected by an electric spark.



BUCKEYE GASOLENE BUGGY. BUCKEYE MFG. CO., ANDERSON, IND.

The machine was geared from 6 to 12 miles an hour, and could be made to back up, go ahead, and change speed by the use of one lever. The steering device was quite novel, being operated either by hand or foot, or by both at the same time.

Owing to the demand for stationary engines the company temporarily abandoned experiments with the motor wagon, but they have recently resumed them with new interest, and will soon have a gasolene vehicle on the market.

The Vanell Steam Carriage.

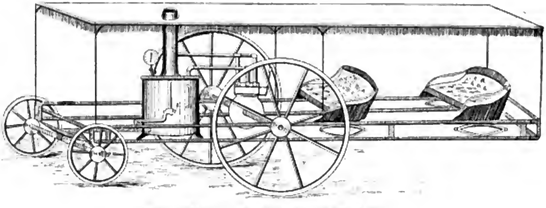
Frank Vanell, 1031 Gurney St., Vincennes, Ind., furnishes a rough sketch of a steam carriage, which he enters in the Chicago Race. The motor which is on the rotary order, is attached to the driving shaft without gearing of any kind. The frame is of wrought iron tubing, so constructed as to be utilized for a water tank. The driving wheels are five feet and the steering wheels two feet in diameter, and all four wheels are fitted with pneumatic tires. The vehicle is steered by a sprocket wheel and chain. The axles are of steel and the bearings anti-friction.

The weight of the vehicle is about 1200 pounds and its cost, so the inventor states, is $275.

The Barrows Electric Vehicle.

The C. H. Barrows Electric Vehicle is the invention of Charles H. Barrows, of Willimantic, Conn. As will be noticed in the cut the vehicle is in the tricycle form. Unlike all other motor vehicles the forward wheel is the driving wheel and is claimed to be a perfect locomotive complete in itself. It is made with one hub, two sets of spokes, and two rims with solid rubber tires. Between the two sets of spokes is securely fastened a large sprocket rim carrying a sprocket chain, which engages with the very small sprocket pinion of an electric motor, carried at the base of the steering spindle of the bifurcated post, which straddles the driving wheel and in which the wheel is journalized in ball-bearings.

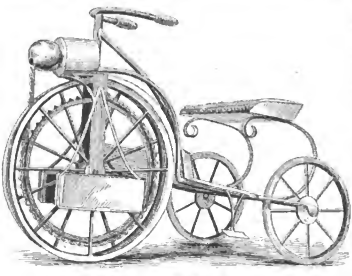
The energy which is utilized by the electric motor at a speed reduction of 14 to 1 is stored in a primary battery contained in two cabinets each 24x8x8 inches, which are disposed one on each side of the driving wheel, supported in the centre by a foot piece at the lower end of the bifurcated post, and at the ends by supporting rods reaching down from the shoulder over the wheel. This battery weighs 100 pounds and has a normal output of 25 amperes at 30 volts for 10 hours, and is capable of giving 50 amperes for a short time, thus making available a little over two horse-power. The long leverage of the gearing between the motor pinion and the driving wheel is said to give a fast speed electric motor an advantage of three to one over a slow speed petroleum motor for a given speed of the vehicle. This combination the inventor thinks is equivalent to at least four horse-power as utilized to drive motor vehicles of 1,500 pounds weight.



STEAM CARRIAGE. FRANK VANELL, VINCENNES, IND.

The entire weight of the Barrows vehicle built to carry two or three passengers will be 300 pounds. Its speed will be anything desired from a crawl up to a mile in three minutes, and it will be at all times under control like a trolley car. It will surmount the grade of a country road as easily as a bicycle.

The carriage part of the vehicle is a light structure consisting of a simple frame work with a wide comfortable seat and two pneumatic-tired wheels hung in ball-bearings. Each wheel is independently journaled whereby all extra friction on curves is avoided. Steering is accomplished by means of a handle bar similar to the handle bar of a bicycle.



ELECTRIC TRICYCLE. C. H. BARROWS, WILLIMANTIC, CONN.

The front wheel of the vehicle being the driving wheel and carrying within itself the total locomotion force, it is practically a mechanical horse and is attached to the carriage in the rear by a tube and spindle in the same manner as a bicycle. The "horse" may be detached from one carriage and hitched to another in a minute, and is expected to work as well in a sleigh as in a carriage.

The inventor calculates that one filling of the cells will run the vehicle from 100 to 150 miles according to condition of roads and load carried. The cells may be refilled wherever water fresh or salt can be procured to reduce the concentrated solution to the proper strength. Enough of the concentrated solution may be carried for a 500 mile run. The cost of refilling the cells is 50 cents. The vehicle may be in constant use 24 hours per day every day in the year, so the inventor claims, and is applicable to both business and pleasure purposes.

The cut herewith is from a photograph of a rough model and does not show the finish and symmetrical form of the perfect machine.

◆

The Moehn Gasolene Wagon.

J. N. Moehn, 1810 Fond du Lac Avenue, Milwaukee, Wis., who has nearly two hundred patents of various kinds, is constructing a three-seated wagon to be propelled by a 9 horse power gasolene motor, weighing 200 pounds.

The frame is of screw-shaped anchor steel, and the rig complete is expected to weigh about 700 pounds.

The motor has three parallel cylinders, made of brass, while the pistons are of cast iron. To avoid drying of the oil, round rings are used instead of flat, to lessen friction. An explosion is obtained every revolution, and one, two or three cylinders can be used as required by the load drawn or the conditions of the road.

The motor can be stopped by the change of the exhaust, as a locomotive is, or the gear may be thrown out, while the engine continues running. The motor is started by a lever.

For throwing in and out of gear a clutch is employed, and the brake is part of an eccentric on the axle.

The lowest speed provided for is 1 mile an hour, and Mr. Moehn believes that on good roads there would be practically no limit to the speed he might attain.

The steering arrangement resembles that used on a boat. So great is the leverage obtained that it is only necessary to move the handles of the wheel from one inch to one and a half in rounding a corner, and to back up a turn of 8 inches is necessary.

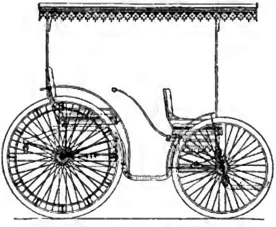
Ignition is effected by means of an electric spark. Power is applied to the hind axle by means of a chain and sprocket.

The wheels are fitted with solid rubber tires.

◆

The Arnold Electric Carriage.

Early in 1894, B. J. Arnold, a well-known electrical engineer of Chicago, made a design for an electric carriage, intended for boulevard service. Being an experienced designer of traction engines, Mr. Arnold introduced some novel features in the power transmission and compensating gear. The batteries are provided for under the body of the wagon, and the steering is managed from the rear seat, instead of the front, as is usual in motor wagons. Owing to press of other business, Mr. Arnold has been unable to put his design into practical shape.



ELECTRIC CARRIAGE. B. J. ARNOLD, CHICAGO, ILL.

◆

A Compressed Air Bicycle.

Lewis B. White, of New York, is the inventor of a motor bicycle which runs by compressed air, the rider compressing it as he goes.

In general appearance the new bicycle differs but little from the ordinary roadster used by wheelmen. There is a large case, forming the center of the driving wheel and a small compressed air apartment directly in front of it. Just behind the steering wheel the power is formed by two pistons working from the ordinary pedals with eccentric cranks instead of the sprocket chains used at present.

By a clever arrangement of pipes, these pistons, instead of the ordinary rods of the present wheel, force water, greatly compressed, around over the top of the machine, through a compressed air apartment and against a motor wheel enclosed in the case in the rear wheel.

This water then falls into the bottom of the case, and returns to the pumps again, thus being used over and over again, as it is impossible for the water to escape. There is a brake on the machine, the same as on those at present in use.

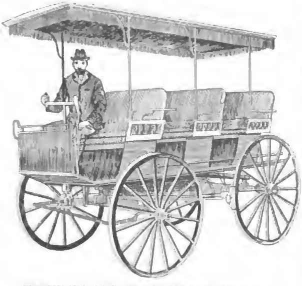
Another strong feature of the new bicycle, the inventor claims, is the fact that power can be stored to help ascend hills. Mr. White says that in the standard makes of wheels only 33 per cent. of the rider's energy is utilized, while on his machine 90 per cent. will be converted into power. Only the air resistance prevents the rider from easily trebling the ordinary speed.

The weight of the new wheel is said to be only a few pounds in excess of the ordinary safety.

◆

The Sturges Electric Motocycle.

Harold Sturges, of the Sturges Electric Motocycle Co., Marquette Building, Chicago, Ill., has devoted some three years to the study of the horseless or motor vehicle. The carriage illustrated here was constructed for the World's Fair, and did considerable service at that time. It has also been frequently seen about the streets of Chicago since the announcement of the *Times-Herald* contest.

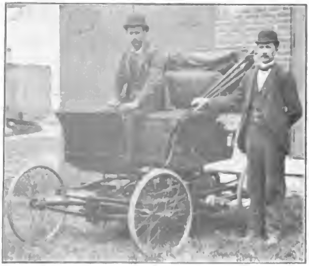


ELECTRIC MOTOCYCLE, HAROLD STURGES, CHICAGO, ILL.

Mr. Sturges believes it is possible for electric vehicles to make a run of sixty miles on one charge, and that they will soon be in common use in large cities. Mr. Sturges is constructing a new vehicle for the *Times-Herald* contest, which will embody a number of improvements over the present one.

The Haynes Gasolene Carriage.

Elwood Haynes, of Kokomo, Ind., has built several motor carriages. The first example of his skill has a body of the ordinary type with spring cushion, and a seat for two persons. The motor is an upright two horse power gasolene engine of the Clerk Cycle type, and is located just in front of the rear wheels, where it is rigidly attached to the frame of the running gears. The body of the carriage is entirely free from the motor so that the side springs may work freely. The framework, or running gears, are entirely of steel. The main portions are made of steel tubing securely brazed to steel castings, thus making a very rigid frame.



GASOLENE CARRIAGE. ELWOOD HAYNES, KOKOMO, IND.

The weight of the carriage with full equipment of water, gasolene, battery, etc., is 1050 pounds. The wheels are 28 inches in diameter and are fitted with ball bearings and solid 1½-inch rubber tires. The draw or pull required to move the carriage over a level road varies from 35 to 50 pounds.

Haynes & Apperson, of Kokomo, Ind., will manufacture the Haynes vehicles on an extensive scale.

◆

The Praul Rotary Gasolene Motor.

John E. Praul, of 262 N. Broad St., Philadelphia, is the inventor of a compact rotary engine, which he originally designed for aerial navigation, and is now adapting to vehicles.

Mr. Praul defines his motor as a differential piston rotary engine. A separate cylinder is used to compress the charge of air and gasoline vapor, and deliver it to the cylinder of the engine, where it is exploded. There are two working strokes for each revolution, and every stroke is a working stroke. No fly wheel is required.

A company called the Praul Motocycle Co., with a capital stock of $100,000, has been organized to manufacture the Praul motor vehicles, which, it is stated will be made in various styles and at different prices.

The vehicle built by Mr. Praul for the Chicago Race is a four-wheeled racing machine of bicycle construction. It weighs complete with fuel about 100 lbs., carries two persons, and can be sold at $250. Mr. Praul has been a diligent student of aerial navigation for many years and a company called the Praul Aero-motor Co., has been for some time engaged in the development of his inventions in this line.

◆

Dr. Best's Attachment.

Dr. A. W. J. Best, of Arcadia, Fla., is the patentee of a motor wagon gearing or attachment with which he states any motor can be used.

He describes it as "simply a spur-wheel through which the hind axle or shaft passes. The spur-wheel is usually two feet in diameter and from two inches to three inches face, according to the horse-power needed. This wheel revolves on the axle and the axle revolves in this wheel.

"Facing this wheel on the right and left sides are two beveled wheels which mesh into the spur-wheel by means of several pinions shafted loosely into the inner periphery of the spur-wheel; these wheels and pinions form a space of two feet diameter by five inches thick, including all inner space of the gearing, and the upper half of this is all the space occupied by the gearing of all machinery estimated for a six or more horse-power. All the gearing is only about fifteen or twenty per cent. more in cost than any other wagon or buggy of the same capacity.

"Our four horse-power wagon is strong enough to carry four tons. It weighs, when complete for work, with the motor mounted: If for coal or wood, 2,200 pounds; if for oil; 1,600; if for electricity, about 1,800; if for gas, 1,100 or 1,200."

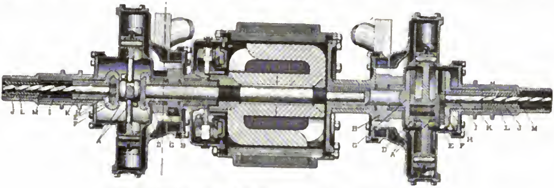
Dey System of Propelling Street Cars and Wagons.

An important departure in the electric carriage line is suggested by Harry P. Dey, of the Dey-Griswold Co., of New York.

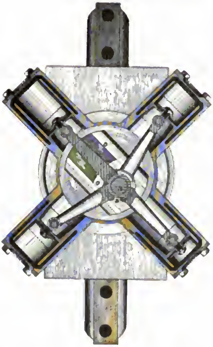
A single electric motor is used, the armature and field of which both revolve. On the shaft of each is placed a pump having 4 cylinders arranged radially (see Fig. 1). The pistons are single acting, and all four are attached, in the same place, to one crank pin, by adjustable rings A.A, (Fig. 2). This crank pin is adjustable, while in motion, moving ¾ of an inch either side of the center, giving a maximum stroke of 1½ inches, and a variable pumping capacity from zero to maximum, in either direction, without steps or reversing valves.

ELECTRIC PHÆTON. DEY-GRISWOLD CO., NEW YORK.

On the rear axle is placed what is known as the gear type of fluid motors. Two are used, one at each wheel, and are piped separately to their respective pumps, allowing each wheel to revolve independent of the other. The pumps, pipes and fluid motors are filled with oil. It is evident that when the pumps are operated they will force the oil through the pipes, to the fluid motors, and pressing against the teeth will turn the wheels. The greater the stroke, and hence the capacity of the pumps, the faster the speed of the carriage will be. The axle motors will in turn act as pumps, and drive the pumps themselves as fluid motors, and the electric motor as a dynamo, and thus charge the batteries whenever mechanical power is applied to the wheels, as on descending hills, etc. It is also apparent that when the crank pin is at the center, the pistons are held rigid, and it is then utterly impossible for the wheels to turn, although the motor is running continuously. As an example of the immense starting torque, let us suppose that the crank pin is moved $\frac{1}{16}$ inch from the center; the piston stroke will then be $\frac{1}{8}$ inch; this being $\frac{1}{24}$ of the maximum stroke, gives 24 times the pull it would have at the maximum. This principle is of great value on very bad roads and steep hills. In addition to this it also has the fly-wheel capacity of the continuously running field and armature. It combines the power of the hydraulic press and the speed of the electric motor in one mechanism. As the crank pin is moved further from the center, it increases the length of the stroke and consequently the pumping capacity and speed of the vehicle. If the pin be moved back the wheels will immediately have to decrease their speed, or the pumps and electric motor increase theirs. An increase in the latter would instantly convert it into a dynamo, as the counter electro-motive force would overcome the applied electro-motive force. This will act as the best of electric brakes until the carriage comes to its proper speed. If the pin is carried past the center it reverses the direction of the flow of oil to the fluid motors, because of the change in the relative positions of the valve B and the pin. This drives the carriage backward. The valve above mentioned is the only one in the whole apparatus. The construction of it is simple, there being one casting, with two plain parts, keyed to the shaft.

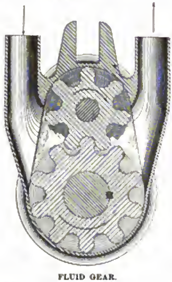


TRANSVERSE SECTION OF ELECTRIC MOTOR AND PUMPS.—DEY SYSTEM.



PUMP.

The governing of the crank pin is as follows: The crank pin and the beveled plates D and E form practically one piece. Though made in two parts, one part threads into the other. These plates slide into the dove-tailed grooves of plates F and G; plate E has a rack which meshes with the pinion H, the latter is keyed to shaft I, which has four parallel, high pitched threads cut upon it. The nut J threads on these, and also slides in a groove in K which is an extension of the main shaft, with which all of these parts revolve. L is normally a stationary nut threaded on the outside, and having the nut J freely revolving inside of it. These keep their relative positions by means of the collar shown. Working in the thread of L is the sprocket nut M, which is connected by a chain to another sprocket on the controlling wheel shaft. The turning of the controlling wheel turns the nut M, which draws L in or out; this in turn draws K in or out, revolving I and H to move



FLUID GEAR.

the crank pin. It will be seen that in any position the crank pin is locked. In some cases an electrical device will be used instead of the chain, a very simple and neat device having been designed for that purpose. The turning of this wheel governs the speed, while swinging it sideways guides the vehicle. It can be pushed forward out of the way of those entering or leaving, and then drawn up to a convenient position, so that a person can rest against the back of the seat and drive in perfect comfort. The wheel is designed and mounted similar to a pilot wheel, but has in addition a short handle projecting from the center of the wheel for convenience in guiding.

The fluid motor will be readily understood by an inspection of Fig. 3, noting carefully the direction of the arrows.

The rear wheels of Mr. Dey's carriage will be 30 inches in diameter and have ball bearings and cushion tires. The front ones will be of the same style, but 24 inches in diameter.

It is a well-known fact among electricians that from five to eight times the requisite motive power is placed on a car in order to obtain the necessary torque to start, especially on grades and curves, and this has to be largely increased on carriages, because of ruts, muddy roads and heavier grades, for the rated horse power of a motor is not delivered until it is running at its rated speed. Let us take for example a 20 horse power car motor, designed to run at 600 revolutions per minute. Now if it is only running at 6 revolutions (and it hasn't that to start with), it will only be delivering 1/100 part of 20 horse power unless overloaded. At the same time the motor is consuming nearly ten horse power of current when using the best known methods of electrical control. With this system the motor always runs at its rated speed, and delivers its rated power when required, under all circumstances, and the current consumed is in almost exact proportion to the load. Suppose for example that the handle is set for ten miles an hour, running along on a good road, then about one horse power would be coming from the batteries.

If we come to a little grade the motor will automatically take a little more current. If the grade gets heavier more current comes. On a down grade, the motor changes to a dynamo and puts back current to the battery; the steeper the hill the more the return, and at the same time it is acting as a brake. This is all accomplished without once changing the handle or having any automatic devices for the purpose, simply the variations in the counter electro-motive force of the motor. The speed of the carriage will remain absolutely uniform, within a few per cent. under all conditions, and constant attention to speed is done away with. With this system then, the motor need only be built to meet the average load or horse power; consequently a very light motor may be used. Then, again, this is divided by 2 because the armature and field both revolve.

As almost all braking power is transformed as electrical energy back to the battery a very large saving is made in the size, weight and cost of the storage battery, besides a similar saving in the cost of recharging them.

A special battery will be used, called the Dey High Potential Series Storage Battery which can be built to give a very high voltage. A voltage high enough to charge direct from an incandescent or arc circuit may be obtained by a very few cells. Six cells will be used (although fewer can be) These cells are about 25 per cent. lighter than the others of the same horse power. And as lightness begets lightness, less power is required with the light vehicle. A carriage complete carrying from two to four people 75 miles on one charge will not weigh more than 900 pounds, and will cost to run ⅜ of a cent per mile, buying the current at present rates from electric light companies, and about one tenth of that if a man has his own plant, as many merchants have.

The Dey-Griswold Co., 108 Fulton Street, New York, has been incorporated, to put this invention on the market. Harry E. Rey inventor of the system is president and general manager.

Acetylene as a Motive Agent.

All the world is now familiar with the discovery of a new and economical method of producing carbide of calcium which was accidentally made by T. L. Willson, while experimenting in North Carolina with an electric furnace. This discovery bids fair to bring within the range of the arts, in hundreds of applications, the wonderful acetylene gas, produced by decomposing carbide of calcium with water.

Carbide of calcium, which chemists have long sought to synthesize in a cheap manner, is a dark brown, dense substance, resulting from the union of lime and coal. Its specific gravity is 2.262. In a dry atmosphere it is odorless, but in a damp atmosphere it is attacked by the moisture in the air, and its outer surface decomposed, causing a pungent odor, not unlike that of garlic. It is not inflammable.

Acetylene gas, which is produced by decomposing carbide of calcium in water, is a colorless gas, burning with a luminous, sooty flame. It may be heated to a temperature of 870° F., and under a pressure of 43 atmospheres, without decomposition. It is readily condensed into liquid form, when it can be conveniently stored for light and power purposes.

One pound of carbide of calcium generates 5,892 cubic feet of acetylene gas. One pound of liquid acetylene, evaporated at 640° F., will produce 4½ cubic feet of gas, or a volume 400 times larger than that of the liquid. The illuminating power of acetylene as compared with city gas is 10 to 1, surpassing all other known illuminants.

There are two methods of producing acetylene, either directly from calcium carbide by decomposition in water or by evolving it from the liquefied gas, held in receivers.

The method of manufacturing the liquefied gas is to decompose carbide of calcium in water in a closed vessel and conduct the gas generated under pressure to a condenser, where it liquefies, and is then drawn off into tanks, ready for distribution.

The amount of oxygen drawn from the air by burning acetylene gas is only one-sixth of that required for burning city gas. The temperature of the acetylene flame is only 900° C., as compared with 1400° C. for ordinary gas.

These are some of the qualities of this marvelous gas, and a number of experimenters are now busily engaged in finding out whether it has not other properties equally desirable, properties which would fit it for the propelling of bicycles and carriages as well as the lighting of the same.

Mr. Willson believes it could be applied for that purpose. A small tank of the liquid gas, weighing not over 70 pounds, would be equivalent to 10,000 cubic feet of city gas, which would run a two-horse power gas engine many hours.

By utilizing lime and coal dust, the latter now a waste product, it is thought that carbide of calcium may eventually be produced at $5 00 a ton.

The application of acetylene for power purposes is now being developed, and the results thus far obtained are said to show that it possesses volume for volume, probably three times the power of the ordinary illuminating gas. These tests have been made in rather a crude manner with an ordinary gas engine not constructed for this purpose. Engines are now being built especially for the application of this gas, and more accurate results will soon be obtained.

It is proposed to employ the acetylene stored in its liquefied condition for the propulsion of cars, carriages, boats, and vessels, bicycles, and also for general power purposes.

In the estimation of those familiar with it, it will be found the cheapest and most positive storage of power yet known.

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Spring Motor Quadricycle.

The picture on this page represents a spring motor vehicle, which was invented some time ago by a Philadelphian. Four powerful springs furnish the propelling force, and it is said the vehicle can make rapid headway on a level road. The springs are scarcely strong enough to make a long run on one winding, and the inventor was so prodigal in the use of gearing as to add unnecessarily to the weight and complication of the machine.

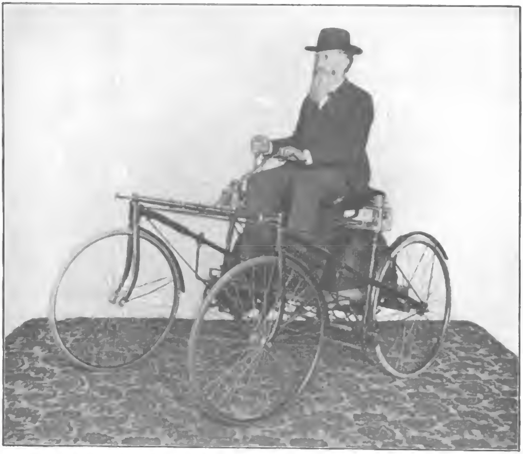
The machine was recently purchased by a New Yorker, who is undertaking to make such alterations as he thinks will adapt it to the market as a light pleasure vehicle. He hopes to be able to run it at twenty miles an hour, and to cover three miles on one winding.

Columbia Perambulator Co's. Electric Wagon.

The Columbia Perambulator Co. of Chicago, who made the roller chairs for the World's Fair, show an electric wagon of light and pleasing construction. It has two seats placed dos-a-dos. The weight of the vehicle is 1,200 lbs., and the weight of the batteries, which were furnished by the Pumpelly-Sorley Storage Battery Co., is 700 lbs.

New and improved features are claimed in the differential gear for regulating the hind wheels, and in the steering device, which is operated by a wheel lever on the right side of the conductor. The steering wheels are pivoted at the hub.

The wheels are of wood, and have the ordinary iron tires. Imperial ball-bearing axles are used. The motor is a special Perret motor. A maximum speed of 10 miles an hour is attained.



SPRING MOTOR QUADRICYCLE.

The J. I. Case Co. Unable to Compete.

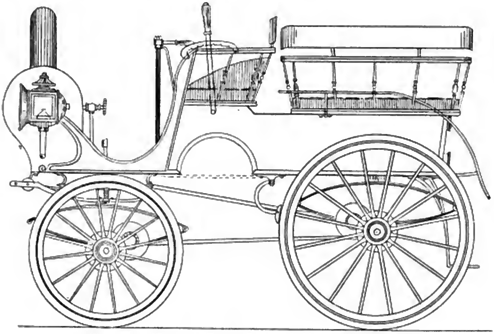
The J. I. Case Threshing Machine Co., Racine, Wis., contemplated making a gasolene motor to compete in the *Times-Herald* contest, but were so crowded with their regular work that they were obliged to abandon the idea. They will doubtless be heard from later in this connection.

The Sweany Steam Carriage.

Dr. F. L. Sweany, of Philadelphia, Pa., is having constructed at the factory of the Chas S. Caffrey Co., Camden, N. J., a steam carriage, in which petroleum is used as a fuel.

There are four two-and-a-half or three horse power motors, one attached to each wheel, and each can be run independently of the other as desired, thus giving a combined force of from 10 to 12 horse power. These motors are very small and light, a recently patented invention, giving the greatest amount of power for the size. The carriage complete will weigh about 1350 lbs.

The steering apparatus is controlled by steam, insuring perfect ease and control of the carriage. A lever controls the application of the steam to the motors, and can be applied to one or all, and reversed at pleasure. A foot brake shuts off the steam and at the same time applies the brake to the wheels.



THE SWEANY STEAM CARRIAGE. CHAS S. CAFFREY CO., CAMDEN, N. J.

The tanks for carrying oil and water are under the seats, entirely concealed from view. The boiler which is placed across the front of body, presents a very neat appearance, as it is covered with patent leather. A packing of magnesium prevents the heat from radiating from the boiler. The maximum speed will be from 16 to 20 miles per hour.

◆

The Perry Lewis Electric Wagon.

J. D. Perry Lewis, 3014 Morgan Street, St., Louis, Mo., recently brought out an electric carriage, which he conducted around the streets of that city with considerable eclat.

It is a high two seated rig. Under the seats are thirty cells of storage batteries of the chloride type. The motor is an invention of Mr. Lewis, and is called by him a quadrupler. It consists of a big armature surrounded by four secondary coils. With this is connected a ratchet wheel that fits into a large, cogged wheel, built solid with the axle. It takes ten hours to store the batteries, and they are then said to be capable of running the vehicle at a speed of twelve miles an hour for four hours. Mr. Lewis states that the full capacity is five horse-power.

In front of the vehicle is a controller similar to the box-like contrivances on electric cars. By this the speed of the machine is regulated. There is a foot brake and a steering lever.

◆

The D. J. Ames Gasolene Phaeton.

D. J. Ames, president of the Owatonna M'f'g Co., Owatonna, Minn., is the designer of a motor vehicle resembling an ordinary phaeton in appearance.

Power is derived from a gasolene engine placed under the seat, the shaft extending forward under the box and connecting the driving gear. The gear shaft is connected to the rear axle by means of a chain and sprocket which is provided with a compensating gear. The driving gear is so arranged that by moving the speed lever the operator can change the speed of the vehicle from the slowest to the fastest speed, without changing the speed of the engine, thus giving the full power of the engine on a slow speed for grades, rough roads, etc.

For a one-seated carriage the engine and all of the gear do not exceed 200 pounds in weight.

The front wheels are pivoted close to the hub and connected together with a rod, and to the rod is connected a lever that extends up and back to a convenient position for the operator who steers with one lever.

The engine is first started and when under motion the power is applied by a lever which also stops and backs while the engine is in motion in the same direction.

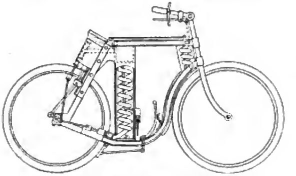
Rubber tires are advocated by Mr. Ames for city vehicles and steel tires for country use.

Twombly's Ether Motor.

Willard I. Twombly of Portland, Me., is the inventor of a light and powerful motor, in which ether is employed to generate vapor. As ether is converted into expanding gas at 96 degrees whereas water requires 212 degrees to convert it into steam, a great saving of heat is effected. A pound of ether converted into gas occupies a third more space than a pound of water converted into steam, hence the gas of ether is a third more powerful than steam.

The inventor constructed a bicycle fitted with his motor, which is described as follows:

The generator, corresponding to a steam boiler, is a small cylinder running downward perpendicularly from the seat. Within this cylinder, which is three inches in diameter and thirty-six inches in length, is a coil of pipe surrounded by asbestos. Stored within are four pounds of ether, which is heated from underneath by burning gasoline supplied from a tank placed in the curved frame that extends from the bottom of the generator to the fork of the front wheel. Reaching from the hub of the rear wheel to the bottom of the generator is a force pump operated by two engines, extending from just behind the saddle down to the hub of the rear wheel on both sides. This pump forces a spray of burning gasolene under the ether. The engines weigh only two pounds apiece, without the pistons, yet they are said to be capable of two horse power each at full pressure, and one horse power each at low pressure. On this basis the generator equals in power a four horse power steam boiler.



ETHER BICYCLE. W. I. TWOMBLY, PORTLAND, ME.

After the vaporized ether has driven the engines the vapor passes through the frame under the seat to the condenser, just above the front wheel, under the handle bar. This condenser is a coil pipe eight inches in length.

Opposite the force pump, on the rear wheel, is an air pump. Along the sides of the reservoir of gasolene in the curving lower frame, which is quite wide, are two pipes. The one on the side of the air pump is used to convey a current of air up to the condenser, where an atomizer arrangement forces gasolene from the tank on to the condenser. This cools with remarkable quickness. The vapor of the ether comes from the engines, is condensed and runs down the pipe on the other side of the gasolene tank and into the generator again. Thus the ether is used over and over again.

The gasolene tank holds enough for 100 miles of travel and it is estimated that a speed of 60 miles an hour can be attained.

The entire bicycle, with pneumatic tires three inches in diameter, weighs only about 60 pounds.

A company called the Lovell Cycle & Ether Motor Co., has been organized to apply this motor to bicycles, vehicles and launches. The factory is located at Portland, Me., where experiments are now going on. The officers of the company are Col. B. S. Lovell, President, and H. L. Lovell, Treasurer. Both gentlemen are connected with the John P. Lovell Arms Co., of Boston, Mass.

The Gawley Gasolene Carriage.

T. R. Gawley, a grocer of Aurora, Neb., enters in the *Times-Herald* Race a four-wheeled two-seated carriage propelled by a gasolene engine, said to be of six horse-power.

The vehicle is fitted with ball bearings. The front wheels are 36 inches and the hind wheels 42 inches. The distance between the axles is 5 ft. 6 inches. The back wheels are on a stiff axle going ahead, but are so constructed that they can turn back, by means of a ratchet. On the back axle the ball bearings are set under the spring blocks. The body is placed on a full platform spring, and there is a common single spring in front.

The engine has two cylinders, makes about 350 revolutions a minute, and is geared even.

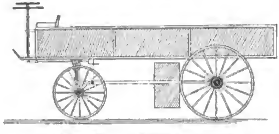
The steering is managed from the rear seat.

Solid rubber tires and wooden wheels are used.

The Wing Work-Wagons.

The old-established gas-engine house of L. J. Wing & Co., 109 Liberty Street, New York City, expect to have out a line of motor work-wagons by January 1st, 1896.

They do not intend to manufacture wagons themselves, but to furnish motors and connections to wagon manufacturers to apply to wagons. They claim to produce a strong, simple and well-made motor. By a new device a large portion of the jar from the impulse is said to be done away with. By their connections of the engine to the wagon, the operator has only one lever or wheel to use for starting, stopping or changing speed, the working parts being automatic.



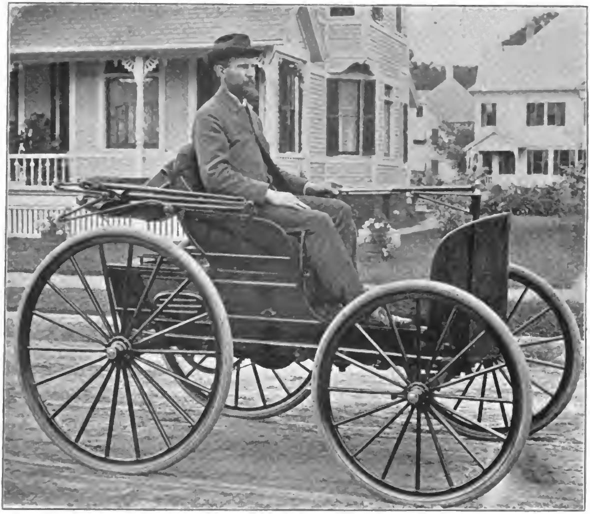
WORK WAGON. L. J. WING & CO., NEW YORK.

The accompanying sketch gives only a mere outline of the general appearance of the wagon. It will be noticed that the motor and connections are all below the body of the wagon, thus leaving the entire space free for the loading and handling of goods. The speed can be varied at pleasure from three to fifteen miles per hour. The motor makes its own gas, as needed, from 76 deg. naphtha.

This firm has made a great success of marine gas engines, having very many in use for power on both pleasure and business boats.

The Duryea Motor Wagon.

Charles E. Duryea, an inventor of Peoria, Ill., has for a number of years taken a deep interest in the solution of the motor vehicle problem. For three years he and his brother, J. Frank Duryea, experimented with a motor wagon at Springfield, Mass. After many preliminary tests the vehicle was finally brought out in the spring of 1895 and publicly exhibited upon the streets of Springfield. It proved to be one of the first practical gasolene vehicles constructed in the United States.



MOTOR ROAD WAGON. DURYEA MOTOR WAGON CO., SPRINGFIELD, MASS.

In appearance the vehicle does not differ materially from an ordinary heavy built buggy. It weighs about 700 pounds, and has ball bearings and rubber tired wheels; the tires also being of Mr. Duryea's invention.

In the foreign motor carriages a brake is generally used for steering purposes, while there are separate switches for each change of speed. The change of speed is accomplished by throwing in various sets of gears. In the Duryea vehicle the change of gears, by an ingenious arrangement of cams and levers, is effected by a vertical movement of the lever without an instant's loss of time.

The difficulty of management with a lever comes in the constant possibility that one of the wheels will hit a stone and turn the carriage aside. In an ordinary carriage, where the wheels turn on a point half way between themselves, it would be impossible to steer with a lever or almost any other device, because the distance of the wheel from the steering head adds just so much leverage to the force of the impact of the stone on the wheel. For this reason it has been arranged on nearly all motor carriages to have a steering head for each wheel as near the wheel as possible, some arranging it as near as possible on the axle-tree, while others have had recourse to the principle of bicycle forks. In the Duryea machine the heads are placed as close as possible to the wheels and at the same time are so angled that their line strikes the plane of the wheel at just the point a stone would naturally be encountered. This practically does away with the leverage, which tends to turn the wheel, by bringing the force along the line of the head.

The arrangement by which this is accomplished is very ingenious. The axletrees, which are fixed to the body of the wagon, divide at the ends into vertical forks. Into these are fitted pieces resembling ordinary carriage hubs in shape, which hold the axles. Through these pieces run the bolts of the head in the direction of the contact of the wheel with the ground. Co-ordination of movement in these separately swung wheels is secured by a connecting rod of iron extending back of the axletree and joined at the center of the wagon with the steering device. The lever in front wholly controls the carriage. The lateral movement turns the wheels, the vertical motion starts and stops the vehicle, changes its rate of speed and also reverses its movement, driving it backward when desired. The lever connections all have ball joints which can never become loose and cause lost motion, everything being positive in its action. A brake drum of peculiar construction placed under the seat, is connected with a thumb-button located at the front corner of the seat and by pressing the thumb upon this button the carriage if running twelve miles an hour can be stopped within a distance of a few feet.

The variable speed ranges from three to sixteen miles an hour, the normal rates being three, six and ten. To obtain these different rates the motor does not change its speed. The increase is made in the gearing which is alternately rawhide and iron, and runs quite still. To obtain a greater speed than ten miles an hour the pressing of the button at the front of the seat will increase the speed of the motor. The mechanism runs upon ball-bearings wherever possible and otherwise metaline bearings are used, rendering oiling unnecessary.

It may be geared to different speeds to suit the roads of any locality, and may be run at any speed desired within its limit of 20 miles an hour. Water is carried to prevent the motor from overheating, and the supply must be renewed each day. The time required to recharge with fuel and water is only five minutes.

The front wheels are 34 inches, and the hind wheels 38 inches in diameter.

The motor has a capacity of four horse-power. It is compactly located in the box of the body, weighs 120 pounds, and is of an improved Otto type, double cylinder, self-regulating as to work required. Peculiar devices are employed in the mixture of the gasolene with air to produce the proper quality of gas, only a small drop of gasolene being used at one time. The gas so produced comes in contact with an electric spark.

The cost of running this carriage is one-fourth of a cent a mile and a supply of gasolene can be carried sufficient for one hundred and fifty miles, and can readily be replenished at any town en route.

It has been run several thousand miles in and around Springfield and has been an object of interest to persons near and far.

The Duryea Motor Wagon Co., which has been organized to manufacture the Duryea wagons at Springfield, Mass., are building two vehicles for the *Times-Herald* contest. They will manufacture for the market the road wagon illustrated here, as well as other types of automobile vehicles, and will be prepared soon to furnish their motors separately to the carriage and wagon building trade.

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The Sintz Gas Engine Co.

This well known concern, located at Grand Rapids, Mich., hoped to finish a vehicle to compete in the *Times Herald* road race, but like many others, they found the period of preparation too short.

They will manufacture gas engines for the carriage and wagon trade. They state that their four-horse power engine weighs 350 lbs., and will turn up as many revolutions as any gas engine made. It has two impulses at each revolution, and is claimed to be as steady and reliable as steam.

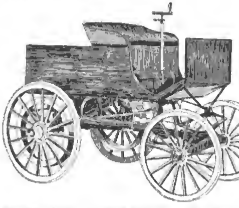
The Sintz engines are largely used for launches as well as for stationary power.

◆

The Baker and Elberg Wagon.

In 1894 Dr. H. C. Baker and J. R. Elberg of Kansas City, Mo., took out patents on an electric wagon, which was occasionally tested on the streets of that city and with some success. The wagon was subsequently purchased by Mr. Stone, a banker of Brenham, Texas, and shipped to New York to undergo alterations at the hands of J. A. Barrett, a well known electrical engineer of the metropolis.

In its present form, after alteration, the wagon weighs about 3,000 pounds, and has but one seat, though accommodations for more persons can easily be made. Storage batteries of the chloride accumulator type, placed under the seat, furnish the power, which is communicated to the wheels by means of a rawhide friction pulley running on a steel flange attached to the inside of the rear wheels. When desired an automatic lever detaches the power from the driving wheel without stopping the motion of the motor.



ELECTRIC WAGON. BAKER & ELBERG, KANSAS CITY, MO.

Steering is effected by a toothed segment and pinion attached to the front axle and is regulated by a steering post easily handled by the operator.

The motor, which is of new design, is compactly built and is controlled by a handle placed directly beneath the steering gear. A turn of this handle throws on more or less current as required, and another handle, conveniently located, reverses the current and starts the vehicle backward. This reverse movement enables the operator to quickly bring the wagon to a standstill without the aid of a brake.

On ordinary good roads a speed of fifteen or eighteen miles an hour can be obtained, and for ascending hills a reserve of twelve horse-power can be drawn upon. A run of about fifty miles can be made with one charge of the batteries.

◆

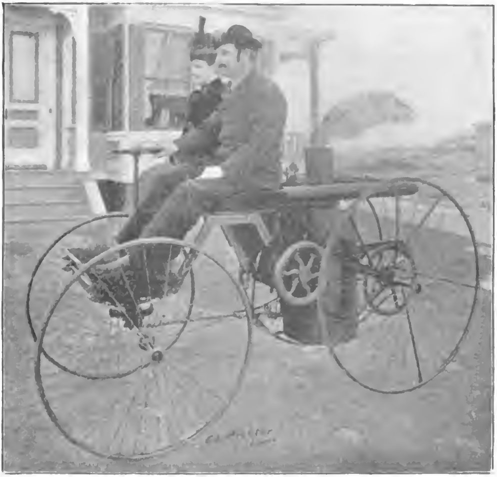
Professor Elihu Thomson Experimenting.

Professor Elihu Thomson, of the Thomson-Houston Electric Co., Lynn, Mass., is conducting experiments in the electric vehicle line at his laboratories at Lynn.

The C. L. Simonds Steam Wagon.

In 1893, Clarence L. Simonds, Lynn, Mass., an engineer in the employ of the Lynn Gas & Electric Co., finished a steam wagon, on which he had been engaged for two years, with the object of providing himself with a ready means of conveyance between the shop and his residence.

The total weight of the wagon without fuel is 437 pounds. The boiler which is of the porcupine type, built to carry 100 pounds of steam to the square inch, has 28 square feet of heating surface. The fuel is naphtha, five gallons being sufficient for a run of 100 miles.



STEAM CARRIAGE. C. L. SIMONDS, LYNN, MASS.

The engine is a two cylinder vertical engine, with cranks set at an angle of 90°, so that there may be no dead point.

There are two pumps, one to feed the boiler, the other to blow the air blast through the naphtha. Under the boiler are five burners so arranged that they can be used singly if desired. The exhaust steam passes through a feed water heater and is then delivered to the naphtha flame, where its presence stifles the noise. Steam can be made in five minutes, and on good roads a speed of 10 miles an hour can be attained. Steep hills can be ascended with two passengers.

This wagon attracted so much attention when it was first brought out, that Mr. Simonds sold it at a round sum to parties who have since used it for exhibition purposes.

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The Daley Gasolene Vehicle for Two.

The vehicle which M. H. Daley, of Charles City, Iowa, enters in the Chicago Race, has bicycle wheels, the two hind drive wheels containing 40 spokes each. All the wheels are 28 inches in diameter, and the front wheel is in bicycle forks to guide by means of a lever. A neat tubular frame sustains the seat, which is intended for two persons. The forward steering wheels rise or fall independently to allow for rough uneven roads.

The weight of the vehicle is about 150 pounds, including canopy top and side curtains, the body of the vehicle being about 14 inches from the ground.

The motor is a double rotary gasolene engine having no dead centres and exploding twice every revolution. The air and gas are forced by the air pump into the motor, and the amount of power is regulated by regulating the time of the explosions, that is, if the explosion takes place after the piston has travelled one inch half as much power will be developed as will be developed if the explosion takes place after the piston has travelled two inches, for in the latter case more air and gas will have been taken in. No governor is required except the lever that regulates the time of the explosion, and a spring stops the motor whenever the hand is removed. The weight of the motor is about 50 pounds, and the dimensions 8 by 4 inches. An air pump applies the brake.

The vehicle is all steel except the seat and top. The hind axle turns with the wheels and has roller or friction ratchets to allow the wheels to turn independently in rounding curves. Ball-bearings are used throughout, and speed is said to be limited only by safety and the condition of roads.

Mr. Daley is the inventor of the lever harrow, now manufactured so extensively throughout the world, and also manufactures his invention himself.

Mr. Daley has adopted the name moto-carriage to designate his vehicle. He expects to make a delivery wagon later on, which he will call moto-wagon.

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The Lewis Motocycle.

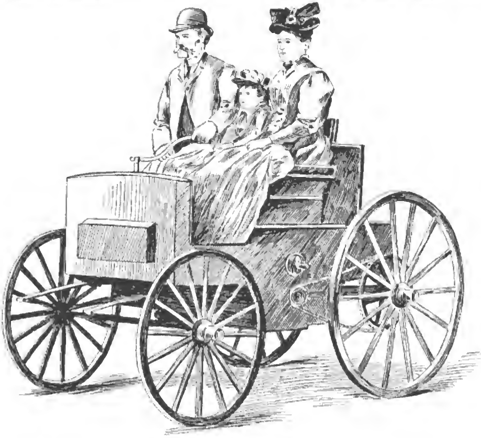
One of the first in this country to prove the practicability of the gasolene road vehicle was Geo. W. Lewis of 32 Willis Court, Chicago, Ill., inventor of the Lewis Gas Engine. In December, 1894, after several years of experiment, he brought out and operated in the neighborhood of his home the one-seated vehicle which is illustrated on this page. The vehicle weighs 1,200 pounds and is propelled by an upright, single cylinder Lewis gas engine of 2 horse power.

Power is transmitted equally to both hind wheels by means of an equalizing gear. The engine is placed in the rear, likewise the battery which furnishes the electric spark. Mr. Lewis designed all parts of this wagon, even to the wheels, which have ball bearings and solid rubber tires.

The vehicle which Mr. Lewis enters in the *Times-Herald* Contest is a two-seated drag, weighing 1,850 pounds. The seats are dos-a-dos and between them covered from view is the motor, a double cylindered 4-horse Lewis gas engine of special construction and weighing 450 pounds. The engine makes from 300 to 500 revolutions a minute. A volume governor is employed so that air and gas are taken in proportion to work done. If it is desired to increase the speed of the motor the operator can do so at will by means of a small lever in front of him. A few turns of a crank is all that is needed to start the motor.

The cylinders are cooled by a patented process, by which the water is used over and over again without waste, the steam being condensed and returning again to the 6 gallon reservoir, located in the front of the wagon.

Mr. Lewis also employs a patented process of making the


THE LEWIS MOTOCYCLE. GEO. W. LEWIS, CHICAGO, ILL.

explosive gas, which he claims produces a better quality of gas, and hence insures even and quick combustion, regularity of explosion, and does away entirely with disagreeable odors.

An interesting feature of this vehicle is found in the mechanism which transmits the power from the motor. The fly wheel of the motor is also a disc from which the power is transmitted to the gear by means of a friction pulley, which runs the vehicle forward or backward, and is also used for a brake. On the bottom of the vehicle, in front of the operator is a rock shaft, upon which the operator places his foot to manage the vehicle. Pressure in one direction sets the vehicle in motion, in the other, stops it.

The speed and power gear is designed for pulling a heavy load or increasing speed as desired. In accomplishing this the speed of the motor need not necessarily be changed. For example, if the occupant of the vehicle wishes to stop and talk with some one for a time, he can set the motor to a slow speed, and thus economize somewhat in consumption of fuel, which under ordinary conditions is about one cent per hour for each horse power. The tank containing the gasolene which holds enough for a 150 mile run, is located in front near the water tank. The gearing is of rawhide, practically doing away with noise.

Steering is accomplished by a bicycle lever in the centre of the axle. Both wheels are operated by means of separate rods connected with the steering lever, and are pivoted at the hub as close in line with the felloe as possible, to make the steering easy and prevent the lever from being jerked out of the hand when an obstacle is encountered.

The battery which supplies the electric spark to the cylinder is placed under the front seat, and in connection with it a very small generator is used to keep the battery in perfect working order.

Wooden wheels are used, fitted with the solid rubber tires of the Rubber Tire Wheel Co., and the axles have roller bearings of Mr. Lewis' own construction. The front wheels are 32 inches and the rear ones 44 inches.

From the main shaft an adjustable connecting rod runs to each sprocket wheel, keeping the distance from the center of the sprocket to the shaft the same under all circumstances, so that the chains will have the proper tension.

Many conveniences are provided for in this wagon. Warm water for washing the hands or face is ready at all times. To prevent this from freezing while the wagon is not in use it is only necessary to open a valve and let it run out.

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The Mann Gasolene Carriage.

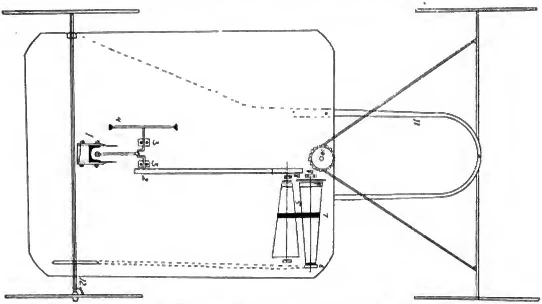
L. C. Mann, president of the Mann Press Co., Gladbrook, Iowa, has built a motor carriage propelled by a high speed gas engine of special design. Speeds varying from three to twenty miles an hour may be obtained without changing the speed of the engine.

The carriage is constructed of heavy steel tubing and has pneumatic tires and ball bearings. The engine known as the Mann Gas Engine, is briefly described as follows :—

The Gas is generated principally by the heat from the exhaust pipe and is used under a high pressure. The governor controls the amount of gasolene admitted to the engine, making it proportional to the amount of power consumed. When the engine is simply propelling itself and doing no work, the amount of gasolene admitted is very small. If a load be suddenly thrown upon it the ball governor will close sufficiently to admit the proper amount of gas to carry that load, unless the load should be greater than the capacity of the engine, in which case the limit of supply would be reached and no more oil would be admitted than could be consumed.

The engine has no gas reservoir. The gas is made only as it enters the cylinder, hence no explosion is possible. It costs about one cent per horse power per hour to run it.

It is built on the interchangeable plan as much as possible, so that costly breaks cannot occur. All the valves are straight lifting valves.



MECHANICAL DIAGRAM OF MOTOR WAGON. L. C. MANN, GLADBROOK, IOWA.

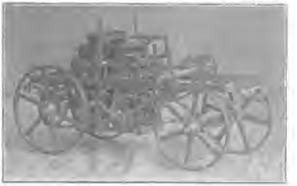
Mr. Mann is building two styles of motor carriages. One light carriage for two persons, which has pneumatic tires and canopy, and is fitted with two-horse power gasolene engine. This entire rig weighs 425 lbs., and is speeded from two to twenty miles per hour.

The other is a heavier delivery and mail wagon, resembling the two-seated spring wagon now in use, except that the forward gear is thrown farther forward as shown in the sketch. The rear seat may be removed if desired.

In the enclosed sketch, the figures locate parts as follows:—Figure 1, cylinder bolted to bottom of bed frame; 2, drive pulley on crank-shaft; 3, roller bearing boxings; 4, fly-wheel which is also used as a hand-wheel in starting engine; 5, cone gears for variation of speed; 6, sprocket wheel for drive chain; 7, rubber belt on rubber-covered cones; 8, two steel gears which are connected by means of a third gear on a shifting lever, and will give a speed of three miles per hour; too slow for the cone belt. When this gear is used, the cone belt by means of a forked lever is thrown on the slip pulley 9, where it has very little tension upon it. The gear is used for climbing hills, and over rugged roads. The cone belt is also shifted on the loose pulley for coasting; 10, guide sprocket from which a handle extends upward to the front seat; 11, spring coupling; 12, lock which causes rear wheels to turn with the axle which revolves in roller bearings. These locks will allow the wheels to move faster than the axle in rounding curve. The rear springs rest upon the roller bearing boxings, and for these boxings a reach extends forward, overlapping the ends of the spring, 11. A light cap closes over both engine and cones. The ordinary carriage wheel is used, and is fitted with rubber tires when desired.

Ingersoll Moore tries Spring Power and Steam.

Ingersoll Moore, of Bloomington, Ill., has devoted much study to the motor vehicle for a number of years. His first model, a spring power vehicle, illustrated here, was constructed in 1890. It is propelled by four batteries of three flat coiled springs each. These are connected by gears, and all are wound up by one lever at the right hand of the seat. By means of double-acting ratchets, the lever winds the springs moving both ways. The vehicle has two speeds, and the brake is applied to a drum by pressing the foot upon a lever in the bottom of the vehicle bed.



SPRING MOTOR VEHICLE. INGERSOLL MOORE, BLOOMINGTON, ILL.

In 1888, Mr. Moore built a four-wheeled two-seated wagon with upright boiler and engine, and in the following year he constructed a three-wheeled model, and the running gear for a six-wheeled vehicle, having the four hind wheels lapped close together, and all four being driven by a chain belt. His latest idea in the vehicle line is a steam vehicle, using gasolene as fuel, and provided with a horizontal compound engine, and steam generator, the latter made of copper and brass. The wagon which he expected to build for the *Times-Herald* contest was of this type. He was unable to mature his plans in season, however.

Joseph Shaver's Steam Buggy.

Joseph Shaver, marble and granite dealer, 17th and Walnut Streets, Milwaukee, Wis., enters in the Chicago Road Race a steam vehicle, in which gasolene is used as fuel.

The engine, boiler, and fuel weigh only about 80 lbs., and the cost of operation is about three cents an hour. The inventor anticipates that he will be able to make 30 miles an hour on a level track.

The motive power is furnished by exploding a spray of gasolene in three small cylinders, two of which exert propelling force, while the third forms an air cushion.

All parts of the machinery run on ball bearings. The axles are also fitted with ball bearings, and the wheels have solid rubber tires ¾ of an inch in diameter. The front wheels are 30 inches, and the hind wheels 34 inches in diameter.

The Parry Mfg. Co. Soon to be Heard From.

The Parry Manufacturing Co., light wagon manufacturers, Indianapolis, Ind., have been experimenting on motor vehicles for three or four years past. They are building several different types of wagons, employing the various methods of power now recommended for the purpose, and expect soon to have something practical to show.

The "Brighton" will be in the Market

The Pierce-Crouch Engine Co., New Brighton, Pa., manufacturers of the "Brighton" gas engines, are getting out a line of vehicle motors for '96 trade.

Owing to the demand for the "Brighton" engines, they were delayed in their experimental work, and could not complete a vehicle for the Road Race.

The Wolverine Gasolene Motors.

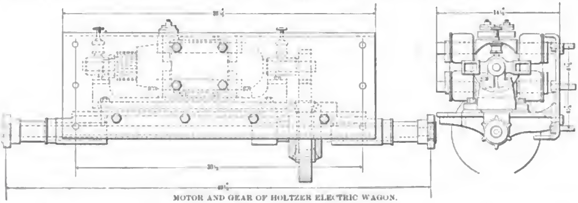
The Wolverine Motor Works, Grand Rapids, Mich., are placing one of their motors on a carriage, and will undoubtedly be in the field next year. The Wolverine motors are the invention of Clark Sintz, a well known expert in gas engines, and command an extensive sale for launch use.

Self-Starting Petroleum Motor.

G. Emil Hesse, an engineer connected with the Ericsson Coast Defense Co., 35 Broadway, N. Y., is at work upon a self-starting petroleum motor for carriages. He believes he has devised a way of accomplishing this object, and expects to conclude his experiments in the near future.

The Holtzer Electric Wagon.

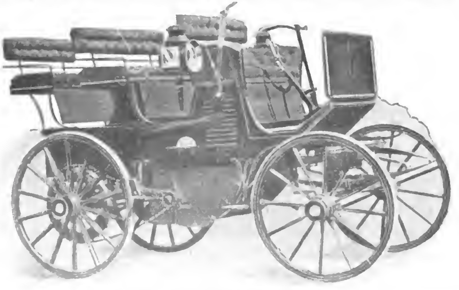
In the spring of 1895 The Holtzer-Cabot Electric Co., of Boston, completed for a wealthy resident of that city an electric wagon modeled after the English brake and capable of seating six or seven persons. Its weight is 5,100 pounds, and it is of the most durable and solid construction throughout.



MOTOR AND GEAR OF HOLTZER ELECTRIC WAGON.

The batteries are contained in the body and under the front seat, and the top or cover of the body which supports the two rear seats is hinged, so that it can be raised and thrown over against the front seat, leaving the cells and all connections accessible for examination or repairs.

The batteries comprise 44, 250 ampere hour Chloride cells, with a nominal discharge rate of 25 amperes. The cells are arranged in four groups of eleven each, and are connected to the motor through a series parallel controller, which puts the groups in multiple series, and multiple series respectively, giving three speeds: 5, 8 and 15 miles an hour. These are operated by the lever shown alongside the steering shaft, and locked in the various positions by engaging with a notched arc and spring latch. This arrangement gives three well defined speeds, and no rheostat is needed. Though put to severe tests in hill climbing and over heavy roads the batteries are said to have been equal to every emergency.



ELECTRIC BRAKE, HOLTZER-CABOT ELECTRIC CO., BOSTON, MASS.

The running gear is very substantially built to stand the strain of heavy loads and rough roads without danger of breaking springs or wheels. To reduce friction the wheels are provided with ball bearings. The body of the wagon is water-tight and acid proof paint has been liberally used over it, so that under no circumstances can the breaking or spilling of a cell damage the motor or its connections underneath.

The steering is arranged at the hubs of the front axle, heavy crank levers being geared to the steering shaft, which is provided with a bicycle handle. A toothed segment with a spring latch is also arranged so that by a slight pressure of the foot the operator may lock the front wheels at any angle. Notwithstanding its immense weight the wagon can be guided by one hand at any speed.

The motor is a 4 pole series wound, of 7½ H. P. capacity, and weighs 450 pounds. Its speed at full load is 250 revolutions, and its efficiency 89 per cent. A phosphor bronze armature pinion engages with a carefully cut intermediate gear, the shaft of which is divided and connected through a differential gearing, allowing the wheels to run at different speeds when rounding corners. The intermediate shaft drives the hind wheels directly by chains, one on each side. The motor and gearing are protected by a light leather casing.

For convenience in backing a reversing switch is mounted on the controller arc and interlocks with it so that the motor cannot be reversed until the controller level is placed at "off."

The speed may be varied from 4 to 15 miles an hour, and all ordinary grades are accomplished with ease. The brake is of the usual coach pattern, and has been found sufficient for all purposes.

Two 10 candle power lamps furnish light by night.

The wagon work was done by Chauncey Thomas & Co., carriage builders of Boston.

The Walton-Tinkham Manufacturing Co. Tricycle Delivery Wagons.

Julian R. Tinkham, of the Tinkham Cycle Co., and Ernest F. Walton, of the same company, with Messrs. De Coppet & Doremus, the well known Wall Street bankers and brokers, have formed a new company called the Walton-Tinkham Manufacturing Co., for the purpose of manufacturing on an extended scale tricycle delivery wagons and carriers in all shapes, to run by both human and mechanical power.

The new company has general offices at 308, 310 West 59th Street, and factory at 226, 228 East 63d Street. The capital of the company is $100,000, and the officers of the company are as follows:—Ernest F. Walton, Pres.; Edward J. De Coppet, Vice-Pres.; Julian R. Tinkham, Sec. and Treas. J. Geo. Ziegler, the well known inventor, who is now superintendent and partner in the Relay Cycle Company of Reading, Pa., will have entire charge of the mechanical department of the new company, and the entire product will be taken and marketed by the Tinkham Cycle Co.

The vehicles which this company will first manufacture, will be similar to the Tinkham carriers, which have already been put on the market by the Tinkham Cycle Co., with such great success.

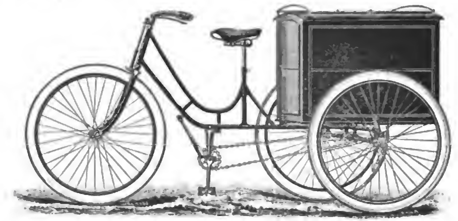
This carrier, although not a motor vehicle in its present form, is yet a sort of forerunner of horseless wagons of all kinds. It is a ball-bearing tricycle of peculiarly strong design and construction, bearing on properly arranged springs over the rear axle a cabinet or receptacle for goods.

The carrier is propelled by ball-bearing cranks and pedals similar to those on a bicycle, which is placed directly in front of the cabinet, the power being transmitted by means of a chain running on two sprocket wheels. The rear sprocket contains differential gear-wheels of unique form, which arrangement allows either wheel to turn independently of the other, although the power is applied equally to each. The frame of the tricycle is of English steel tubing, the connections being drop forgings. The wheels are of steel throughout, and are fitted with 2½ inch quick-repair pneumatic carriage tires, which are practically puncture-proof.

The dimensions of the regular carrier over all are about 6 ft. x 3 ft., but many other sizes including carriers to be propelled by two or more persons have been designed.

The standard cabinets are 2 ft. 9 in. long, 2 ft. 2 in. wide, and 2 ft. 6 in. high. They are of light bass-wood, and are fitted with a nickel plated rail on top to hold packages while loading or unloading. Many other attachments to the carrier frame are used, such as large baskets for laundry use, buggy seats, etc., etc.

The single carriers weigh complete about 80 lbs., the double carriers about 125 lbs., a marked advance over English machines of similar design, which, while being only half as large, weigh almost twice as much. It is claimed that an ordinary boy of twelve to fifteen years can easily propel this vehicle loaded with 100 lbs. of freight for 15 to 20 miles, at an average speed of 10 to 12 miles an hour.



TRICYCLE DELIVERY WAGON. TINKHAM CYCLE CO., NEW YORK.

It is the intention of the Tinkham Cycle Co., to develop business wagons rather than pleasure vehicles, and to this end they have had a special motor designed for this carrier, the first one of which will be seen in the Chicago race, November 2nd. Not being designed for speed, it will not compete for the prizes, but will simply be given a test for quick delivery service over short distances.

These two motor carriers will be followed in the course of a few months by many others of various sizes and designs, adapted to all conditions of roads and for all business purposes. They are not ready yet to give the details of their motor, but it is rumored that in connection with a well known electrical Company, they will before long put on the market an electric motor carrier of unique design.

Among firms using the carriers in their present form, are the following:—Bloomingdale Bros., U. S. Express Co., Maillard, Purcell Manufacturing Co., the Mail & Express, Heller,

Rothchilds & Lang, Richard Webber, Lettuce Cream Co., etc., in New York; Siegel, Cooper & Co., and De Muth & Co. in Chicago, and leading firms in Philadelphia, Washington, Baltimore, St. Louis, Denver, and San Francisco.

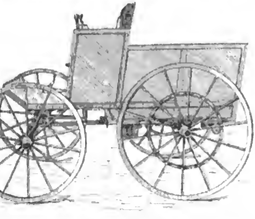
The Roberts Rotary Gasolene Motor.

S. W. Roberts, of the California Introducing Co., 80 Dearborn Street, Chicago, Ill., is about to place on the market a rotary gasolene engine, which he states is entirely without valves. There is a constant piston pressure the full area of the piston during the entire revolution, and the engine has but one moving part. The explosions of gas or gasolene take place in a small chamber leading to a larger reservoir used for equalizing pressure.

Mr. Roberts gives the weight of his engine as 50 pounds, and the horse power generated he estimates at 20. In fact, he states that it can be operated as low as ½ horse power, or extended to 30 horse power if necessary.

The Stewart Motor Wagon.

Richard F. Stewart, of Pocantico Hills, N. Y., has spent much of his spare time the past year in experimenting on a gearing or method of applying power to a motor wagon. He uses a two-horse Daimler motor, which engages with and revolves a shaft extending lengthwise of the vehicle. At the rear end of this shaft is a gear wheel, having on its face three sets of cogs or teeth. The shaft is brought into and out of engagement with the engine by means of a friction clutch.



BUSINESS WAGON. RICHARD F. STEWART, POCANTICO HILLS, N. Y.

Extending across the shaft is a rod, pivoted at one end to a post on the bottom of the vehicle. This rod is fastened by means of a pin to a hub so connected with the clutch that as the rod is swung back and forth it will operate the clutch, and bring the shaft into and out of the engagement. The free end of the rod is pivoted to another rod running at right angles to it and connecting with one arm of the bell crank secured beneath the front of the vehicle. The other arm of the bell crank is connected with a vertical rod, which passes up through the floor of the vehicle in front of the driver's seat, where it can be reached by his foot. Pressure of the foot moves the rod and brings the shaft into and out of engagement with the engine. The gear wheel on the end of the shaft communicating with the engine, meshes into either one of two gear wheels on a shaft at right angles to it, and extending across the bottom of the vehicle to engage with the internal gears on the hind wheels. The vehicle moves forward or backward according as the triple-gear wheel engages with the right hand or left hand wheel at right angles to it. These two wheels are so mounted on the shaft that only one of them at a time can engage with the triple-geared wheel.

Thus different speeds are obtained by moving a lever which is conveniently placed for the hand of the operator, either of the gear wheels is brought into engagement with any one of the sets of teeth on the triple-geared wheel, and the vehicle is moved forward or backward and at any speed desired.

Interference of the cogs of the respective wheels is obviated by drawing the triple-geared wheel back while the other gear wheels are moved.

To allow the wheels to revolve independently in turning, Mr. Stewart has invented an automatic clutch, fastened on the shaft. It consists of a loose collar, within which are recesses extending through the collar and located on opposite sides of the shaft. Within each of these recesses is hung a wedge-shaped key, which turns in the recess sufficiently to throw the upper corner of the key above the face of the collar. A pin or stud on the shaft fits into a recess on the end of the key and turns the latter as the shaft revolves. On the end of the adjoining shaft is a collar, in which there is a small recess of a size and shape to receive the projecting corner of the key, when the latter is thrown out beyond the face of the collar. When the shaft revolves, the pin turns the key in the recess and causes its outer corner to project beyond the collar and engage with the recess in the collar on the adjoining shaft, thus coupling the two shafts together. When the vehicle turns in either direction, the outer wheel turns faster than the inner one, and at once disconnects the clutch.

Dr. Haviland's Motor Buggy.

Dr. Frank M. Haviland, a physician, of 210 West 123rd St., New York, is the inventor of a method of applying power to vehicles, which he believes will be a sensation when it is fully perfected. He is attaching his device to an ordinary side-bar 200 pound buggy, and states that the complete rig, when motor and all are added, will weigh something over 400 pounds. He is using a single-cylinder American motor, and his device is applicable to all classes of wagons.

The doctor could not perfect his apparatus soon enough to compete in the *Times-Herald* contest, but it will be illustrated and described in the next issue of THE HORSELESS AGE.

Barrett and Perret Electric System.

John A. Barrett and Frank Perret, two well-known electrical engineers, the latter the inventor of the Perret Electric Motor, are working jointly on an electric system of propelling and manipulating vehicles.

The Hopkins Motor Cycle.

Nelson S. Hopkins, a mechanical engineer, of Williamsville, N. Y., is the inventor of a motor bicycle, which will be illustrated and fully described in the December number of THE HORSELESS AGE.

The Howard Gasolene Wagon.

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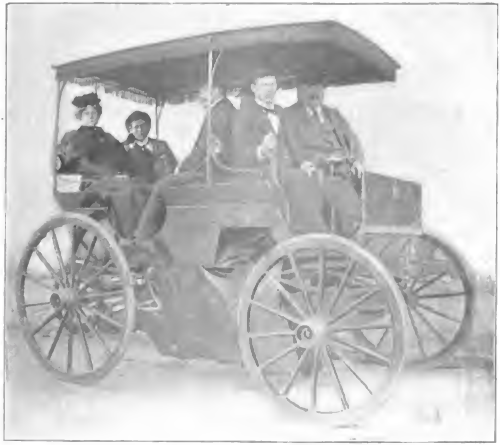
William L. Howard, of the Howard Cycle Co., Trenton, N. J., has just completed a wagon propelled by a six-horse gasolene motor, consisting of two three-horse motors. The wagon weighs 1,700 pounds, and one of its chief features is said to be an automatic device for regulating the speed of the wheels in turning corners. The speeds vary from six to fifteen miles an hour. The wagon is fitted with 2-inch rubber tires, but ordinary axles are employed instead of ball-bearings. The gasolene motor was furnished by L. G. Wing & Co., New York.



GASOLENE WAGON. WILLIAM L. HOWARD, TRENTON, N. J.

The American Motor Co.

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After a series of experiments, extending ever the period of a year Albert T. Otto, of the American Motor Co., (Blount & Otto,) Havemeyer Building, New York, has succeeded in producing an extremely light, powerful and economical vapor engine, which is admirably suited to the propulsion of small boats and vehicles.

These engines are made both vertical and horizontal, the vertical for marine use and the horizontal for vehicles. A two horse engine of either type weighs but 34 pounds, fly wheel included, and measures but 14 inches in length. The cylinder is 3¼ inches in diameter, and the stroke 4 inches. A water jacket is said to be unnecessary, as the cylinder never gets hot enough to interfere with the action of the piston.

The arrangement of the valves is entirely new and decidedly ingenious. They are in fact mixing chambers, regulators, vaporizers and valves in one, thereby greatly reducing the number of parts in the engine.

Another interesting feature of this vertical engine is the automatic device for oiling the connecting rod, a difficulty which is said to be serious in other vertical engines of this kind. Either gasolene, kerosene or city gas can be used as fuel, and either through a carburetor or a vaporizer. No changes in the engine are required when substituting kerosene for gasolene, or vice versa, so that if one kind of fuel cannot be obtained the other will serve the purpose as well. The receiver or fuel tank is at one and the same time a carburetor or a pressure tank, according to the material used. The feed is not dependent on gravity.

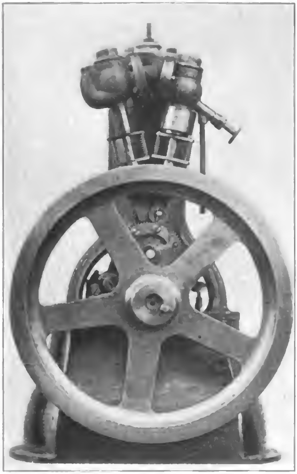
Although so small and light all the parts of the engine are strong and durable.

For heavier work a two cylinder engine will be built, weighing not over 50 pounds, as the weight of the fly wheel need not be increased.

The engine will race at 1,500 revolutions to the minute, the explosions occurring with remarkable regularity at that high speed. The exhaust is quite odorless, a recipe having been discovered by Mr. Otto for deodorizing gasolene.

The motor illustrated here is of the stationary type, and is set on a base to enable the fly-wheel to run clear. In attaching the motor to boats or vehicles, however, no base is needed.

The height of the motor is only 14 inches, and the diameter of the fly-wheel is 12 inches. It can be used in either vertical or horizontal position, and is as well suited for stationary purposes as it is for the propulsion of launches or vehicles.



2 H. P. AMERICAN MOTOR (12 INCH FLY WHEEL).
AMERICAN MOTOR CO., NEW YORK.

In adapting this motor to launches or skiffs, all that is necessary is to fasten it onto the stern-board in a horizontal position with a hand clamp, fly-wheel uppermost, thus avoiding all cutting of the boat. The whole outfit is in one piece, and weighs less than 50 pounds, propeller included. The propeller can be reversed without stopping the engine.

For cat-boats and house-boats a special motor is being constructed on the double cylinder principle. One fly-wheel only will be used, and the portable qualities of the motor will be in no wise impaired. The same motor will also be available for the propelling of two-seated carriages or delivery wagons.

Larger sizes, having four parallel cylinders, will also be constructed for large launches and for stationary use, one shaft and one fly-wheel only being employed.

The feed is controlled absolutely by one valve, so that any speed from 50 revolutions up to 1,500 (racing) can be obtained.

These motor skiffs have been publicly exhibited on the lake in Central Park, New York, where they attracted much attention. A very large demand is anticipated for the marine motor next season, as it can be attached to any small boat without expense, and is sold at a reasonable figure.

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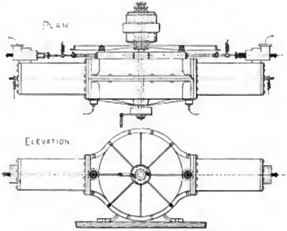
The R. H. Plass Duplex Air-Gas Reciprocating Engine.

These line drawings represent a plan and side elevation of a Duplex Reciprocating Air-Gas Engine, for vehicles, street cars, boats, etc., which in the present embodiment is shown as provided with two cylinders; with a central air-tight chamber arranged between the cylinders receiving the piston rods, and having extended into same the main shaft of the engine; and mounted on this main shaft within the chamber are two fly-wheels, arranged one on each side of the piston rods.

The inlet part of each cylinder is connected by suitable pipes, with tanks containing naphtha, or the like, and compressed air; the naphtha tank is also connected with the central chamber by a pipe. Arranged adjacent to each inlet part is a valve, which is opened by the discharge of the products of explosion, after each explosion takes place, admitting a fresh charge of air and gas into the cylinder. The outlet valves are spring-seated, and are opened at each explosion by means of rods, which receive motion from an eccentric.



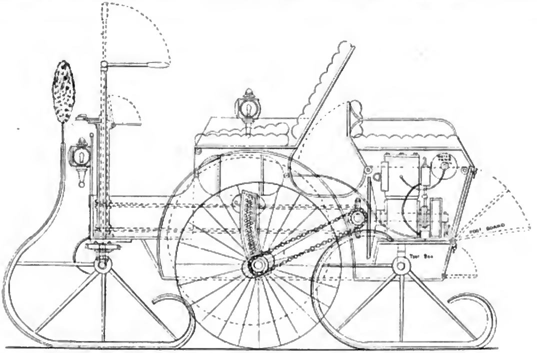
R. H. PLASS, DUPLEX AIR-GAS RECIPROCATING ENGINE

In order that the speed of the engine may be regulated, means are provided whereby, in the event of an excess of speed, the outlet valves remain closed after the explosion, and therefore the engine has nothing to run upon but the gases contained in the cylinders which have already been exploded. To accomplish this automatically, a collar sliding on a key or feather is mounted on the main shaft of engine. In this collar are grooves, receiving rods mounted on the frame of the engine, and another groove receiving the ends of the governor levers, contained within the friction pulley. These governor levers are mounted on a ring which is fixed to the main shaft, and has projecting arms in which the levers are pivoted. The levers are provided at their ends with balls, which are so arranged that, in the event of excessive speed, they will be thrown out by centrifugal force, carrying with them the ends of the levers, and moving inward the outer ends of these fulcrumed levers, causing them to come into contact with the sliding rods, and move them out of line with the stem of the valves. Thus it will be seen that the escape of the gases after explosion in the cylinder will be prevented.

The spark necessary to explode the charges in the cylinders is furnished by a dynamo or electric battery of any suitable kind. The poles of the batteries are connected respectively with the wires on the valve rods and the binding posts on the ends of each cylinder. Projecting inwards from the binding posts, is a rod having a bent end, and mounted within each cylinder, adjacent to the rod, is a lever. This lever is connected by a wire which passes through the hollow stem of the valve, with the wire extending from the dynamo or battery. At one side of the lever is a leaf-spring, the tendency of which is to force the lever into contact with the end of the rod. As the valve is raised it comes into contact with the end of the lever, and removes it from contact with the rod, and at this time the valve is open, allowing the gas to escape from the end of the cylinder. When the valve closes, and when at the same time the piston has compressed its charge in the outer end of the cylinder, the lever is released from the valve and is forced into contact with the rod by means of a spring making a spark at the point of contact with the rod, and thereby exploding the charge in the cylinder.

Upon an elongation of the main shaft of the engine is mounted an eccentric, to which is connected the rod of an air pump, and a pipe joins the air pump with an air reservoir. Air compressed by the pump passes through a pipe into the air reservoir, wherein it is contained under pressure, the degree of pressure being regulated by a safety blow-off valve. A pipe connects the air reservoir with the naphtha tank, and in this way the supply of naphtha is kept under pressure. Loosely mounted on the main shaft of the engine is a pulley having a peripheral face. The pulley forms a part of the means for communicating motion from the engine. In order that the engine may be run continuously, if desired, the pulley is connected to the shaft by a clutch. The outer face of the pulley is bored out, forming a tapering opening; and keyed to the outer end of the shaft, and capable of sliding thereon, is a wheel having a tapering face, and designed to enter the opening of the pulley; the two forming a clutch. This wheel is provided with a reduced part, having a circumferential groove which receives pins projecting from a lever, by which the wheel is moved back and forth on the shaft, enabling the power to be applied or discontinued as required.

This engine is the patent of Reuben H. Plass, a mechanical engineer, of 508 Lafayette Avenue, Brooklyn, N. Y., who has recently patented an elaborate system of propelling and manipulating vehicles, including a plan of a motor sleigh, which is propelled by a wheel placed near the center of the sleigh, under the front seat. The wheel is made very strong in order to withstand the strain imposed upon it. Its tread is therefore made continuous, and the whole main portion of the wheel is made in one piece of metal. The main body of the wheel is fluted or corrugated, and the flutes or corrugations decrease in width from the outer end or bearing surface to the center where they join the hub. In order to strengthen the wheel there is interposed between adjacent wings a rib, which is formed with or attached to the wings, and extends from the hub to a point about midway between the hub and the bearing surface of the wheel.



PLAN OF MOTOR SLEIGH. R. H. PLASS, BROOKLYN, N. Y.

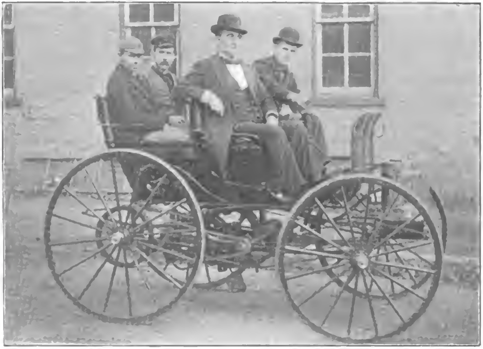
The propelling wheel is keyed to a shaft, mounted in boxes which are arranged in guides connected to the body of the sleigh. The boxes are capable of sliding in the guides, and held in the lower ends of the same, (unless the propelling wheel comes in contact with an obstacle), by coil springs arranged above the boxes and bearing thereon. The guides are curved as shown, their curvature corresponding to the arc of a circle drawn with the shaft from which the propelling wheel receives motion, so that any variation in the height of the shaft carrying the propeller wheel will not affect the driving mechanism.

The power necessary to drive the sleigh is derived from a gas engine arranged beneath the rear seat of the sleigh. The gasolene is contained in two tanks placed under the front seat of the sleigh, and connected with a receiving reservoir by means of pipes.

This engine is termed by the inventor a double reciprocating gas engine, the cranks being enclosed in a case between the two cylinders.

Mr. Plass claims that his sleigh could make headway over ice and snow, and would surmount obstacles with ease.

The same inventor has also designed a series of motor vehicles, including a surrey, delivery wagon, tricycle, doctor's buggy, etc.



MOTOR TRAP. JOHN W. HALL & SONS, JACKSONVILLE, ILL.

The Hall Gasolene Trap.

John W. Hall & Sons, carriage manufacturers, Jacksonville, Ill., have completed a gasolene vehicle, resembling a trap in general style. Passengers can sit dos-a-dos or all facing forward, as desired. The weight of the vehicle is 700 pounds.

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Robertson and Johnson's Storage Battery.

J. Hart Robertson and John Johnson, two electricians of Brooklyn, N. Y., have been conducting experiments for two years past to produce a light, cheap and efficient electric storage battery. An experimental plant of 60 cells is now in daily operation at No. 84 Pearl street, corner of Front street, Brooklyn, the plates contained in the cells being manufactured by a simple and economical process.

The improvement claimed consists entirely in the method of manufacturing the plates, which are made of lead compounded with a secret substance, giving great porosity. Hence a very large surface for electrolytic action is obtained, with greatly increased storage power. A plate 7x9 inches, and one-half inch thick is said to absorb 4½ ounces of water.

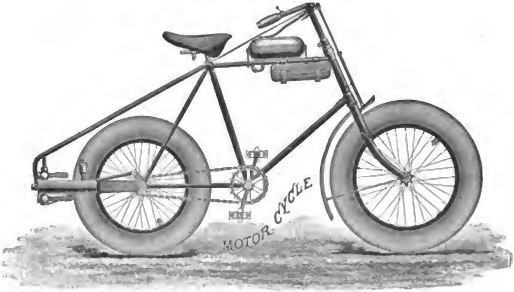
The lead and secret substance are simply mixed thoroughly together and then molded into the form of the plate. So simple is the process that the cells can be sold at about one-half the price charged for the standard storage cells now in market.

Cells for traction purposes, such as motor wagons, would contain from 30 to 50 per cent. of lead in order to reduce the weight to be carried as much as possible, yet it is stated that the capacity of the battery would not be less on that account.

A 100-ampere hour cell for wagon use, containing three plates, would weigh from 10 to 15 pounds. A battery of 50 such cells would, therefore, weigh from 500 to 750 pounds, and would cost 6 cents an ampere hour, or about $300 for the entire battery. This would furnish 13 horse-power for one hour or $1\frac{3}{10}$ horse-power for ten hours.

Other claims made for this battery are that it can be more easily and rapidly recharged than any other known, its life is longer and its efficiency higher.

The Standard Storage Battery Co., 50 Exchange Place, New York, will soon put these batteries on the market.



MOTOR CYCLE RACINE MOTOR VEHICLE CO., RACINE, WIS.

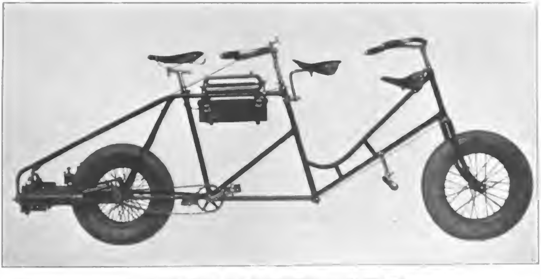
Kane-Pennington Hot Air Engine.
Racine Motor Vehicle Co.

Thos. Kane & Co., manufacturers of school and office furniture, launches, etc., Chicago, Ill., and Racine, Wis., are manufacturing under the above name the hot air engines invented by E J. Pennington.

This engine runs at 500 revolutions a minute. The fuel consumed is gasolene or ordinary kerosene oil, which is supplied to the engine from a small tank by gravitation. The amount required is said to be about $\frac{1}{10}$ of a gallon per hour for each horse power.

A small primary battery is placed in some convenient place, and from it a copper wire leads into the interior of the engine, carrying an electric spark. By utilizing the well known principle that rapid evaporation produces cold the inventor claims to have done away with the water jacket, for, both heat and cold being produced, the cylinder never becomes overheated. While one end of each cylinder is producing power the other is said to be producing cold.

There are either one, two or four cylinders, according to the amount of power developed. Each cylinder is 2½ inches in diameter, has a six inch stroke, and is made of specially drawn steel tube tested to a pressure of 8,000 pounds to the square inch. The lower end is brazed into an iron frame, and all bolts are welded so that they cannot be moved.



MOTOR TANDEM. RACINE MOTOR VEHICLE CO., RACINE, WIS.

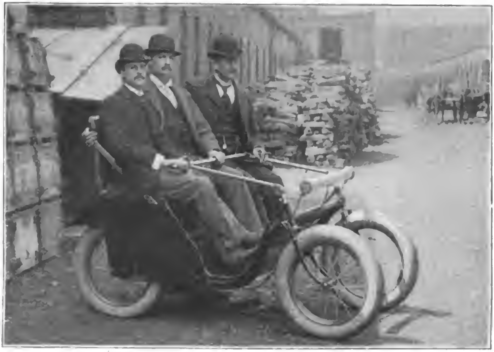
The piston is made loose with spring rings, and requires no packing. By loosening a single bolt it can be drawn out and the working parts examined.

The coil spring producing the electric spark in the cylinder is of light untempered steel wire, which the makers say neither heat nor use will injuriously effect. Should it become worn it can be taken out and a new spring substituted in five minutes. The other working parts are the light gears and rods to operate the exhaust and regulate the oil supply.

The balance wheel is used to start the engine, one turn being sufficient for this purpose. On all sizes of engines the balance wheel is only 20 inches in diameter.

The speed is regulated by increasing or diminishing the flow of oil, and the engine is stopped by throwing off the switch from the battery. The engine can also be reversed. When the electric current is shut off the cylinders become air brakes, and a quick stop can be made.

The manufacturers claim for this engine great simplicity, safety, economy of fuel, lightness, noiselessness, and efficiency.



VICTORIA. RACINE MOTOR VEHICLE CO., RACINE, WIS.

This engine is a two-horse, two-cylinder horizontal engine, weighing 120 pounds. The four-horse power engine has four cylinders.

Motor cycles propelled by these engines were exhibited at the Cycle Show in New York, in January, 1895, and attracted much attention.

The "Victoria" is a four-wheeled vehicle, upholstered in a first-class manner, capable of comfortably seating four people.

A four-inch pneumatic tire is used, which does away with nearly all vibration. The tires are fitted with non-puncturing strips, making it impossible to have a puncture, thereby saving time and the inconvenience of repairing punctures on the road.

The frame is made of bicycle steel tubing, ball-bearing throughout, with all the latest improvements. All cups and cones are made of the best stub steel, thoroughly hardened.

It is steered by means of the handle bars, which run directly to the forks of the front wheels.

The engine is located under the seat, being held in place by hangers projecting from the frame of the vehicle. The power is transmitted by means of sprockets and chains directly from the engine shaft to intermediate sprockets, arranged on the shaft underneath the front part of the seat.

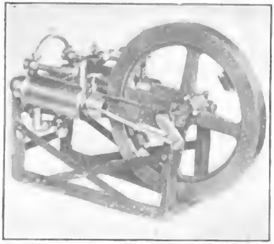
The engine is controlled by a lever running up in front of the seat, convenient for the person who is operating the vehicle, and by the simple movement of this lever the engine can be reversed or stopped, and the vehicle can be run at any speed from one to twenty-four miles an hour.

The fluid is supplied from a tank in front of the vehicle over the front wheels, and runs through a small tube to the cylinders, where it is mixed with air, compressed and ignited, producing the requisite power to run the vehicle

In the winter time a set of runners are attached directly under the front wheels, and the exhaust which runs to the muffling box is used to heat the vehicle, so that one can enjoy a first-class sleigh ride and be kept comfortably warm from the waste heat coming from the exhaust.

The vehicle is also fitted with a cyclometer, registering the number of miles made each day, and a speedometer showing the rate of speed, also a cycle clock in plain view of the occupants.

The Racine Motor Vehicle Co., which has been organized by a number of prominent business men of Racine, Wis., to place on the market different styles of vehicles, propelled by Kane-Pennington engines, expect to have four vehicles in the *Times-Herald* contest—a motor cycle, a tandem, a victoria, and a



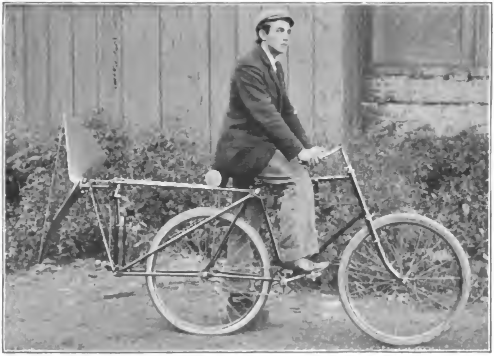
2 H. P. KANE'S PENNINGTON ENGINE.

three-seated victoria built on the same general model as the single-seated vehicle, and propelled by a six-horse engine.

The bicycle with rotary attachment on the rear of the frame, is Mr. Pennington's latest idea. It is said to greatly add to the speed of the bicycle.

At an exhibition given in Milwaukee, Wis., recently, Mr. Pennington covered a mile on his motor cycle in 58 seconds.

A number of the large bicycle manufacturers are preparing to apply Kane-Pennington engines to their machines, and motor cycles will be a familiar sight before the close of 1896. The manufacturers of the engines, Thos. Kane & Co., Racine and Chicago, have several hundred of them in course of construction, ranging in power from two-horse up to ten-horse, and adapted to all classes of vehicles and small boats.



FAN-MOTOR BICYCLE. E. J. PENNINGTON, RACINE, WIS.

Morris and Salom's Electric Wagons. The "Electrobat."

—o—

The first electric wagon ever constructed in Philadelphia appeared on the streets of that city in August, 1894. It was the joint labor of Henry G. Morris, mechanical engineer and Pedro G. Salom, electrician, and was built purely for experimental purposes. Practice demonstrated that the calculations of the inventors had been carefully made. The wagon has been run hundreds of miles over the city streets and through the Boulevards of Fairmount Park, without any serious mishap.

The total weight of the vehicle, including the battery, is 4,250 pounds. The weight of the battery is 1,600 pounds. The maximum mileage on one charge is 50 to 100, according to speed and grades, and the maximum speed attainable is 15 miles an hour.

The battery consists of 60 Chloride Accumulators of 100 ampere hours capacity each, and its electrical capacity is 13 H. P., at the maximum discharge rate.

The motor is a nominal 3 H. P. Electric Launch type, built by the General Electric Company, and capable of developing for a short time 9 H. P. Its weight is three hundred pounds.

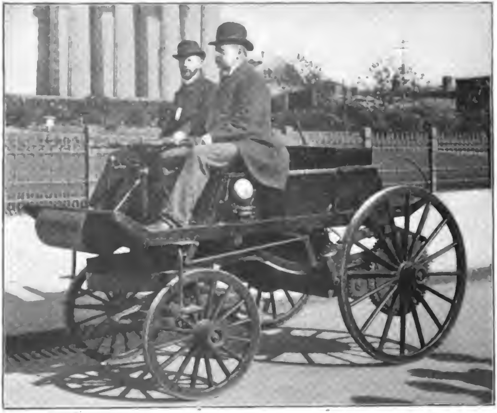
Through a pinion on the end of the motor shaft the motor is connected to a secondary or countershaft having a balance gear to enable the wheels to move independently in turning curves. This countershaft has on its ends pinions gearing into large gears attached to the rear wheels of the wagon.

The front of the wagon rests upon a fifth wheel of 30 inches diameter which is attached by an iron frame to the rear axle. The lower half, or revolving part of the fifth wheel, rests on the springs between it and the front axle This fifth wheel turns on hardened steel balls, and is moved by a pinion and shaft with suitable reducing gear, which is operated by means of the hand wheel on top of the shaft.

This arrangement, it is claimed, makes steering easy and accurate.

The controller regulating the current is placed in front of the footboard and is operated by a shaft and crank immediately below the steering wheel.

The inventors secured patents on the main features of the wagon, and proceeded at once to build two more wagons embodying such improvements as had been suggested by the first attempt.



EXPERIMENTAL ELECTRIC WAGON. MORRIS & SALOM, PHILADELPHIA, PA.

The two electric vehicles which Morris & Salom enter in the Chicago Race, will exhibit some highly novel features. The chloride accumulator batteries will be employed, but in a new and special form, which gives high power and light weight. The vehicles weigh about 1,600 lbs each, and will differ in the mechanical application of the power.

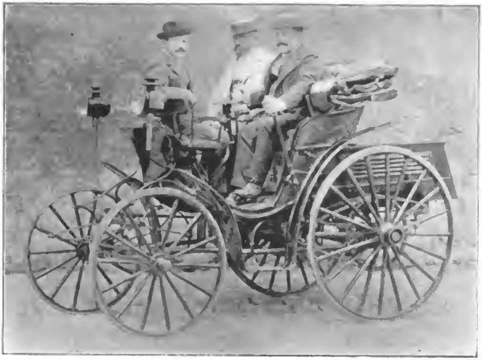
Morris & Salom have adopted an original name, "Electrobat," for these new vehicles, which will first be built for park wagons and doctors' buggies.

Roger American Mechanical Carriage Co.

A company of this name has been organized in New York City to take over the patents of E. Roger, motor and carriage manufacturer of Paris, France, who secured two prizes in the Paris-Bordeaux-Paris Race last June. The company will adopt the Roger motor as a basis of operations, and will make such changes as will render their vehicles better suited to the American market.

They will build one and two-seated carriages similar in style to the one illustrated here, surreys, wagonettes, coupes, and first-class delivery wagons for Express Companies and wholesale houses.

Offices will be opened both east and west in the near future, with general headquarters in New York. W. P. Williams, engineer of the company, will be pleased to give further information at Room 82, 80 Broadway, New York.



ROGER PETROLEUM CARRIAGE. ROGER AMERICAN MECHANICAL CARRIAGE CO., NEW YORK.

The Schleicher Business Wagons.

George Schleicher, of Schleicher & Sons, piano manufacturers, Stamford, Conn., has about completed a business wagon, one of the novel features of which is the wheels. These are of corrugated stamped steel, surrounded by a heavy rim of the same material. The hubs are of aluminum, and are securely bolted to the steel. The hind wheels, which are of considerably larger diameter than the front wheels, weigh about 100 lbs. apiece.

* * *

Lawson Kerosene Motor.

Samuel Lawson, of Welch & Lawson, manufacturers of the Lawson gas engines, 205 Centre Street, New York, is manufacturing a kerosene wagon motor in two sizes, one single cylinder of approximately 3-horse power, the other a double cylinder engine of full 4-horse power.

The weight of the double cylinder engine is about 400 pounds. The cylinders, which are parallel, are 4x6 inches, and the water jacket for cooling is cast in the same piece with them.

There are four poppet valves, controlled by independent cams, making the engine practically noiseless in running, and two fly wheels weighing together about 125 pounds.

The supply of oil is carried in a tank capable of holding about five gallons, and is pumped into the retort, to be converted into vapor as is required by the speed of the motor. As there are two governors, one for each cylinder, the supply of oil can easily be regulated to each cylinder.

An ignition tube is used instead of the electric spark.

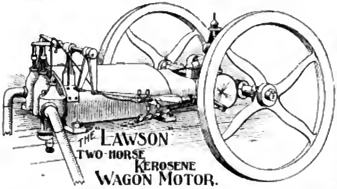
One cylinder is regulated to 350 revolutions, the other to 325 revolutions. Hence one cylinder alone does the work under ordinary conditions, but when a hill is to be surmounted, or a heavy load to be hauled, the other cylinder takes hold with it. This very ingenious arrangement reduces the consumption of oil materially so that it will probably not exceed in cost two or three cents an hour.

The exhaust goes into two muffling chambers.

The 4-horse engine is intended for a surry, and the 3-horse for a road wagon. Both are strong and durable in construction, built to stand the wear and tear of daily use over rough roads and pavements.

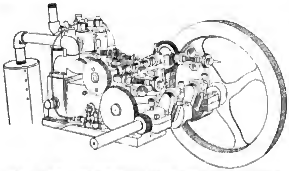
Mr. Lawson has also just completed a two-horse power, single-cylinder kerosene engine for a runabout wagon. The cylinder is 5 inches, and the stroke 7 inches. Two fly-wheels weighing 50 lbs. apiece are used, and the number of revolutions is between 400 and 500. With the exception of the single cylinder, the engine is the same as that previously described, governed automatically, and regulated according to work performed.

The runabout wagon in which this engine is placed, weighs about 550 lbs., the total weight of the vehicle, engine included being 850 lbs. The general build of the wagon closely resembles the T cart, the hind axle being made heavier, and the body about a foot longer than is customary, to accommodate the motor.



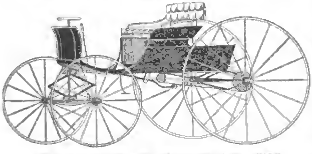
The hind axle is fitted with elastic roller bearings, and the wheels which are respectively 40 and 34 inches in diameter run on solid rubber tires, firmly vulcanized to the rim by a new process.

Steering is accomplished by a fifth-wheel having a quarter gear.



THE LAWSON FOUR HORSE POWER KEROSENE WAGON MOTOR.

Speeds from one mile an hour up to fifteen miles an hour are obtained by one lever controlling a friction disc, and there are a reversing gear, and a friction on the hind axle for sudden stops. The hind wheels can be thrown out of gear as needed. The engine is imbedded in rubber to prevent vibration.



MOTOR ROAD WAGON. WELCH & LAWSON, NEW YORK.

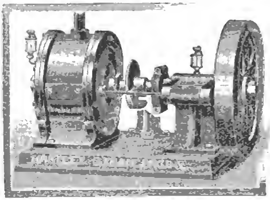
This wagon, intended for every-day use on rough city pavements, was built by F. Bolten, wagon builder of 144 West 39th Street, New York City, who is also making for his own use a business wagon propelled by one of the double-cylinder four-horse motors already described.

Mr Lawson is designing a 15-horse power kerosene motor for independent street car propulsion.

The Hartley Motor.

The Hartley engine was designed more particularly for power purposes, but as the *Times-Herald* offer for the motor carriage was made about the time the Hartley Power & Supply Co., of 21 Monadnock Block, Chicago, commenced business, Mr. Hartley devoted some of his attention to perfecting an engine and attachments for that purpose, and fitted up two motor vehicles with his motor, one being a heavy truck wagon for the Chicago & Englewood Express line, and the other a two-seated carriage, designed to compete in the *Times-Herald* contest.

It is claimed that the new methods of construction and handling of power in the Hartley rotary engine increase the strength, diminish the weight as well as the space occupied, yet maintain all the necessary qualities for the ideal road engine or horseless carriage; viz., the even and steady pulling quality, which automatically adjusts itself, instantly furnishing the right amount required under the most trying and variable circumstances. The weight of a two-horse Hartley engine propelling a two-seated carriage, with fuel for a ten-hour journey, is about 100 pounds, and where roads permit, the vehicle is said to be capable of a speed of thirty miles an hour.



Both the amount of power and speed are regulated by a lever, and can be changed from a snail's pace to full speed or from no power to four-horse at will, all by the action of the one lever.

For the Hartley motor strong claims are advanced. It is stated that it will transmit the whole power of the steam to a direct rotary motion, and use it expansively. It is neither a rotary nor a piston engine, but a combination of the best features of both—the rotary or endless movement of the one and the cylinder and automatic cut-off principles of the other.

The engine has an endless cylinder, thereby doing away with the cross heads, crank arms, shafts, etc. It takes steam by means of an automatic self-adjusting eccentric, thereby using only the necessary amount of power to do its allotted work. All the movable joints are self-lubricating and have self-adjusting metal packing, making it absolutely proof against leakage. In construction and working it is a double self-acting slide valve engine, one being handled by means of the eccentric and the other valve by steam and air cushions. It is very compact and strong in construction, being simply a box with a shaft passing through it with the driving pulley attached at the end, thus occupying but little floor space. Being an endless cylinder with a self-adjusting automatic head working against air cushions (which prevents pounding and wear), this head is handled or adjusted by the steam as it passes from the steam chest to the cylinder, and does not in any way detract from the power of the same. Its exhaust is always open, doing away with the cylinder cocks and preventing accidents from accumulated water. It is said to occupy only about half as much space as other engines and to generate twice the power at a given expense.

The Ames Steam Vehicle.

A. C. Ames, South Chicago, Ill., is constructing for the *Times-Herald* Race, a ball-bearing, pneumatic-tired vehicle, weighing not less than 800 lbs., and carrying two persons. The motive power will be two 1-horse power steam engines of the oscillating type.

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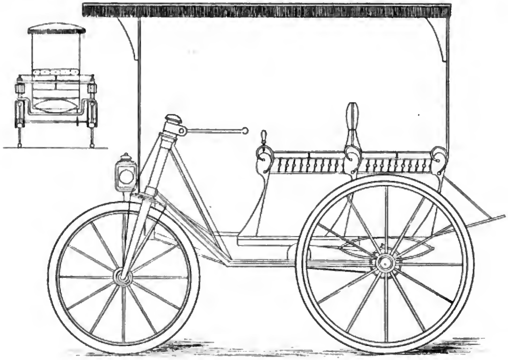
The Banker Victoria.

Banker Bros., cycle dealers, corner Highland and Centre Avenues, Pittsburgh, Pa., are building a motor victoria of the Kane-Pennington type, designed to carry two persons at a speed of fifteen miles an hour. They will use a 2-horse engine.



KEROSENE CARRIAGE. C. J. & J. W. SCHOENING, OAK PARK, ILL.

The engine shown here is designed for general power purposes, but the one used for carriages is constructed the same except that the fly wheel is discarded and another head is inserted instead, making it an engine without dead centres, capable of exerting its full power at any part of the stroke.

The weight of the Hartley trap entered in the race, is 500 pounds, and the mechanism, engine, boiler and attachments add about 200 more, making the total weight of the vehicle 700 pounds. The engine develops four horse power. It is designed to carry four or five persons, having a seat in front for two, and a rear seat wide enough for three. The tires are of rubber.

The Hartley Power Supply Co. have completed arrangements to manufacture these engines extensively for vehicles. They state that they are able to construct a two horse carriage motor of steel, weighing only about 22 pounds.

Three wheeled vehicles will also be built by this company in the near future.

The Schoening Kerosene Carriage.

The accompanying illustration of which the smaller is a front view, is the motor vehicle made by C. J. & J. W. Schoening, of Oak Park. Ill.

The drawing power is a double cylinder kerosene engine of decidedly peculiar construction, yet remarkable power, both piston rods operating on one crank in a horizontal plane. The valve mechanism, oil pump and water circulator are operated by one rod and one movement.

The engines after being started require no external heat nor electric spark to ignite the charge, making accidental fire to clothing impossible. A positive insulation secures a retention of heat in mixing chamber and insures cool cylinders.

A very complete oil governor regulates the supply of oil according to power required, injecting nozzle, expanding or contracting according to road and load.

The water cooler is in harmony with the engine, being a system of small brass tubes exposed to a strong circulation of air from the fly-wheel. The fly-wheel and tubes are under the carriage bottom, yet provision is made against freezing, as in severe weather a warm air current may be sent through the tubes at the will of operator.

The compactness of the engines which run on ball bearings, is remarkable for their power, which is said to be 5-horse power encompassed in a space of 22 x 12 x 6 inches.

The engines transmit their power by friction to the axle.

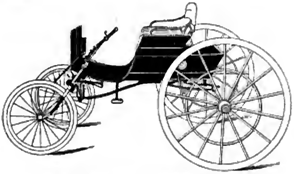
A speed of from four to thirty miles an hour is taken by an ingenious mechanism, simple, noiseless, and absolutely positive. The vehicle is moved forward or backward at will of the operator, and on heavy roads or grades the full power is applied at slow speed.

The vehicle is guided by a single lever pivoted to the dashboard, said lever also disconnecting power and applying brakes simultaneously by one downward movement, insuring absolute control in the most simple way. The compounding of levers is so arranged that a child of eight years has brought the vehicle to a stand within forty feet from a speed of fifteen miles an hour. Guiding by this single lever is perfect, as the vehicle can be turned in its own length. Provision is also made that the operator may leave the vehicle absolutely safe with brakes on and locked. This is accomplished by a single backward movement of the controlling lever which releases it and permits the operator to take it with him.

The vehicle, as will be seen, is provided with large pneumatic tires and Hyatt elastic roller bearings. It has seating capacity for four persons, the rear seat being arranged for facing forward or dos-a-dos as desired. A canopy top with side curtains is furnished for inclement weather. The weight of the vehicle is 600 lbs.

The Carpenter Electric Vehicle.

H. H. Carpenter, of Denver, Col., presents an electric vehicle of unusually light and pleasing construction, in which a storage battery of his own invention is used. The front wheels are of bicycle build, and the steering is operated by a lever.



ELECTRIC WAGON. H. H. CARPENTER, DENVER, COL.

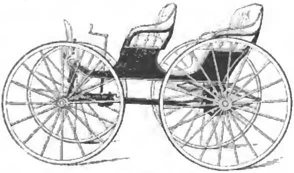
The Verret Motor Wagon.

N. J. Verret, a mechanic of Pine Bluff, Ark., is building a general utility wagon on the bicycle plan, weighing about 500 lbs., and costing about $500.

The Elston Motor Vehicle.

R. W. Elston, of Charlevoix, Mich., enters in the *Times-Herald* Race a two-seated vehicle equipped with a Kane-Pennington engine of 4-horse power.

The steering apparatus consists of one segment, two pinions, and one steering post. Power is applied equally to both hind wheels. A speed of twenty-five miles an hour is claimed by the inventor.



GASOLENE VEHICLE. R. W. ELSTON, CHARLEVOIX, MICH.

Thomas Kane & Co., Chicago and Racine.

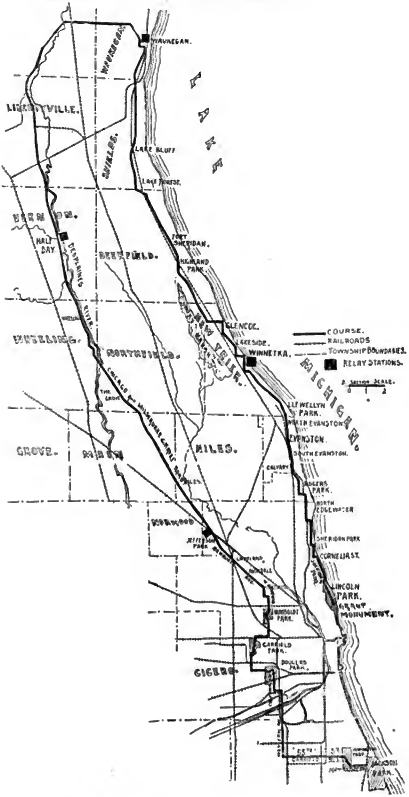
This firm has entered four vehicles in the *Times-Herald* Road Race, as follows:

First, a four-wheeled Victoria with a seating capacity for four persons. Second, a four-wheeled Victoria with a seating capacity for two persons. Third, a Tandem Motor Cycle for two persons, and a single Motor Cycle for one or two persons.

The illustrations of these vehicles which appear on a preceding page show that the manufacturers have made radical changes over the ordinary type. They have, in fact, gone back to the early days of Rome, when the low chariots were used by the nobility as well as in warfare, and in the races and public games. The Victoria is such a type of vehicle, and is constructed low, so that one can get easily in and out, that there may be no liability of overturning, and that the best results may be obtained from the motive power for speed and economy in running. Twenty-six inch wheels are used, with heavy steel spokes and four inch pneumatic tires, non-puncturable, and attached mechanically to the rim, so that it is impossible to pull them off. The frame of the Victoria is very novel in construction, combining greatest strength with least weight. It is of steel tubing, with graceful bends, giving great strength and beauty of outline. The natural spring from the frame and pneumatic tires gives the engine the same effect as a pivoted compass, imparting no vibration or uneven jar to the vehicle. There is a device attached to the rear wheels, so that in turning a corner one wheel travels faster than the other.

The steering apparatus is very simple and effective. The wheels are pivoted on ball bearings, so that they can be readily turned by the steering handle. A very unique but effective brake is attached to the side of the vehicle. It consists of a pivoted rod held in place by a coil spring and operated by being thrown as a friction against the ground.

Thomas Kane & Co. are the manufacturers of the motive power used on all these vehicles, which is known as the Kane-Pennington Electro-Oil Engine, and is considered by the makers the lightest engine ever constructed, developing the same relative horse power. Principles are used entirely new and



ROUTE OF ROAD RACE. (*Chicago Times-Herald.*)

differing from the ordinary gas engine type. The engine has very few parts, consisting simply of a thin steel tube with a tensile strength of eight thousand pounds, a piston and connecting rod, and an inlet valve admitting the oil with an outlet valve allowing the exhaust to escape, and a simple electric device for operating the engine. This engine employs electricity not only for ignition purposes but also for deriving a great part of its power, and might be rightly called an electric engine. In a recent test 45 per cent. more efficiency was obtained by this method over the ordinary use of an electric spark. Common kerosene or gasolene is admitted into the cylinder and the current from a small primary battery is utilized, 1st, to convert the oil into gas; and 2nd, to explode it in the cylinder. This process forms a perfect combustible mixture, so that there is no smoke or poisonous gases given forth from the exhaust, and the maximum power is obtained from the oil with no waste. Another remarkable reaction from this electrical process is the cooling of the cylinder caused by the rapid evaporation, so that only sufficient water is required to keep an equal temperature, that is, about one gallon per horse power, and the water is used over and over again. For this purpose a small brass tube is slipped over the cylinder, which adds only a little to the weight, and gives the engine a neat appearance.

The four-wheeled Victoria has attached to it two 2-horse power 2-cylinder engines, suspended from underneath the seat, so that the entire mechanism is completely out of sight. These engines are coupled together, and drive one shaft. Chains and sprockets are used to transmit the power, and by the use of a variable speed regulator, one to thirty miles an hour can be obtained. The oil tank for supplying the engine is placed behind the seat, so that it cannot be seen, and will carry a sufficient supply of oil to run for several days' time. The water tank, made of brass, nickel-plated, is attached in front to the dash-board, and is rather ornamental than otherwise. Along the side and back of the vehicle is a running board, so that the engines can be oiled or any of the parts gotten at when the vehicle is under way, if necessity require it.

Among other novel features are two electric head lights, operated from the batteries, and a warning gong bell. A footman's seat has also been provided in the rear of the vehicle, which can be utilized by the party operating and caring for the vehicle. Provisions are made in winter for keeping the steering handles warm by running the exhaust through them. The consumption of fuel does not exceed a gallon of oil per horse power in a fonrteen hours' run, making the cost of operating very cheap and much less than the feed of a horse. The weight of the Kane-Pennington electro oil vehicle engine, with supporting frame and balance wheel, does not exceed 60 lbs. per horse power. The engine attached to the motor cycle is connected direct to the driving wheel and so dispenses with the frame and balance wheel, and the weight does not exceed 12 lbs per horse power. The two-wheeled Victoria is constructed in somewhat the same manner as the four-wheeled, except that it is of lighter frame and has attached to it one 2-H. P. 2-cylinder engine. It has a speed up to twenty miles an hour and can be regulated down as slow as is required. The entire vehicle, with machinery, weighs less than 400 lbs., and will be in great demand for touring purposes throughout the country.

The Tandem, intended to carry two or three persons, has 22-inch wheels and 4-inch pneumatic tires. It has attached to it a 2-H. P. 2-cylinder engine, connected direct to the back wheel, and dispenses with frame and balance wheel. The entire mechanism weighs less than 25 lbs. The oil is stored in a small tank suspended from the frame in front, underneath which the battery is placed in a neat leather case. There is a rod regulating the oil supply near the seat of the tandem, which places the vehicle under perfect control of the rider to set the speed from one mile to fifty miles per hour. Attached to the handle is a switch for throwing the battery on and off. The tandem can be stopped very quickly by throwing off the electric switch and thus turning the cylinders of the engine into air compressors.

The Carbonic Acid Motor.

A company called The New Power Co., has recently been organized in New York, to apply the carbonic acid motor to the propulsion of street cars and wagons. They claim to have overcome the difficulties heretofore encountered in dealing with this refractory substance, and believe that their motor has a great future.

Leon Abbett, Jr., Second National Bank Building, Hoboken, N. J., represents this interest.

TIMES-HERALD CONTEST.

Rules and Route of the Road Race.

Complete List of Entries.

In July last, H. H. Kohlsaat, proprietor of the Chicago *Times-Herald*, offered through the medium of that paper, prizes amounting to $5,000.00 to be awarded after a contest or competition, for motor vehicles, to take place at Chicago, on November 2d.

The published offer and the rules laid down for the competition are as follows:

With a desire to promote, encourage and stimulate the invention, development, perfection and general adoption of motor vehicles or motocycles, the *Times-Herald* offers the following prizes, amounting to $5,000, divided as stated:

First prize—$2,000 and a gold medal, the same being open to competition to the world. Second prize—$1,500 with a stipulation that in the event the first prize is awarded to a vehicle of foreign invention or manufacture, this prize shall go to the most successful American competitor. Third prize—$1,000. Fourth prize—$500. The third and fourth prizes are open to all competitors, foreign and American.

It must not be supposed that in this contest the question of speed is the only requisite to be considered. It would be possible for an ingenious mechanic to construct a machine with which he could easily outstrip all others in this contest, and yet that device would be of no utility, and the outcome of no value to the world from a practical point of view.

It is the earnest desire of this paper, that this contest shall add to the sum of our mechanical knowledge in this, the new branch of the science of transportation. In this spirit, the following rules are laid down for the guidance of all who may desire to enter into the competition:

The date of the contest will be on Saturday, Nov. 2, 1895. The judges may postpone the contest if in their judgment the state of the weather or the condition of the roads will not permit a fair trial.

COURSE OF THE CONTEST.

The contestants will start at the junction of Midway Plaisance and Jackson Park, and at the signal from the judges will take up the following course: West on Midway Plaisance to Washington Park; north-west through Washington Park past the refectory to Garfield Boulevard or Fifty-fifth Street; west on Garfield Boulevard to Western Avenue, which is also a boulevard; north on Western Avenue Boulevard to Thirty-fourth Street, at which point the boulevard is left, and a short turn is made to the west, and the route continues north on Western Avenue proper to Twenty-sixth Street, thence west to the boulevard; north and west on the boulevard to California Avenue; north on California Avenue to Ogden Avenue and Douglas Park; north-west through Douglas Park to Fourteenth Street Boulevard, which turns and leads north to Garfield Park; through Garfield and Humboldt Parks by the connecting boulevards to the intersection of Humboldt Boulevard and Milwaukee Avenue; north-west on Milwaukee Avenue to Jefferson Park, and thence north-west and north on the Chicago and Milwaukee gravel road, which is a continuation of Milwaukee Avenue; through Niles, Wheeling, Half Day and Libertyville to Gurnee, where the route turns directly east on Grand Avenue to Waukegan. From Waukegan the route proceeds south on an easily followed road through South Waukegan, Lake Bluff, Lake Forest, Fort Sheridan, Highland Park, Ravinia, Glencoe, Winnetka and Wilmette to Evanston. From Evanston south on Chicago Avenue to Grand Avenue; east on Grand Avenue to Kenmore Avenue; south on Kenmore Avenue to Lawrence Avenue; east on Lawrence Avenue to the Sheridan Road; south on the Sheridan Road to Grace Street; east on Grace Street to Pine Grove Avenue; south on Pine Grove Avenue to Cornelia Street; east on Cornelia to the Lake Shore Boulevard, and thence south to Lincoln Park, and along the Lake Shore drive to the Grant monument, where the finish will be made.

Two weeks before the contest the following notice will be conspicuously displayed at all points along the route where a turn is made, or where the intersecting roads are such as to render the exact course uncertain:

ROUTE OF
THE TIMES-HERALD ☞
MOTOCYCLE CONTEST.

This is for the guidance of those who desire to familiarize themselves with the route in advance of the day of the contest. On November 2, there will be stationed at all such points an officer of the contest with a flag, who will point out the course to the contestants.

In making awards the judges will carefully consider the various points of excellence as displayed by the respective vehicles, and so far as possible select as prize winners those constructions which combine in the highest degree the following features and requisites, rating them of value in the order named:

A. General utility, ease of control and adaptability to the various forms of work which may be demanded of a vehicle motor. In other words, the construction which is in every way the most practical.

B. Speed.

C. Cost, which includes the original expense of the motor, and its connecting mechanism, and the probable annual item of repairs.

D. Economy of operation, in which shall be taken into consideration the average cost per mile of the power required at the various speeds which may be developed.

E. General appearance and excellence of design. While it is desired that competing vehicles present as neat and elegant an appearance as possible, it should be assumed that any skilled carriage-maker can surround a practical motor with a beautiful and even luxurious frame.

The judges appointed are:—General Merritt, U. S. Army, chief of the department of the Missouri, with Colonel Marshall I. Ludington as coadjutor; Prof. John P. Barrett, city electrician of Chicago, with Leland L. Summers as coadjutor, and Henry Timken, president of the National Carriage Builders Association, with C. P. Kimball as coadjutor.

The following are the official rules of the contest:—The hour of start from the junction of the Midway Plaisance and Jackson Park has been changed from 8 a.m. to 7.30 a.m.

RULES OF CONTEST.

ART. 1. The contest or race will be international in character, and any vehicle complying with the conditions may compete.

The vehicles shall have three or more running wheels, and shall derive their motive power from within themselves. No vehicle will be admitted to the competition which depends in any way upon muscular exertion except for the purpose of guidance.

ART. 2. The vehicles shall be capable of carrying at least two persons, one of whom shall be an umpire selected by the judges, the other or others may be the representatives of the owner of the vehicle. An umpire must accompany each vehicle over the route.

ART. 3. The route will be from the Midway Plaisance, Chic., via Jefferson Park and Half Day to Waukegan and from Waukegan south through Winnetka to Lincoln Park, following the official course outlined in detail by maps which will be furnished to each contestant. Jefferson Park, Half Day, Waukegan and Winnetka are relay places, at which motive power may be replenished.

ART. 4. There will be stationed at each relay point a timekeeper, who will report the time of arrival and departure, but stoppage at relay stations will be optional with contestants, and no allowance will be made for delays in replenishing.

ART. 5. It is expected that each contestant will make his own arrangements for replenishing motive power, or taking advantage of the relay facilities.

The umpires will be furnished with a correct statement of supplies, furnished at the starting point, at each relay point, and where possible of the amounts remaining after completion of course.

ART. 6. Vehicles will assemble at the junction of the Midway Plaisance and Jackson Park at 7 30 a m., Nov. 2, 1895, and take such positions as may be assigned them by the judges.

ART. 7. Each vehicle entered shall carry a card conspicuously displayed, this consisting of a white card 12 inches square provided with a black letter 6 inches long. Each contestant shall be designated by number. The numbers and order of starting shall be designated by the judges.

ART. 8. The starting point will be the Midway Plaisance and Jackson Park, from which point the vehicles will proceed through Washington Park and the route outlined to the corner of Halsted Street and Garfield Boulevard. Up to this point the carriages will move along without attempting to pass each other, maintaining the order in which they started, and endeavoring as nearly as possible to keep the same distance apart as at the time of starting. No trial of speed will be permitted between the limits of the Park and Halsted Street. At this latter point they will halt and be started by signal from the judges.

ART. 9. Contestants may change conductors at such points as they may desire. The umpire appointed by the judges will remain with the vehicle until it finishes the contest, either by completion of the course or by withdrawal.

Art 10 Each vehicle shall be provided with three lights. These should be of any of the standard carriage or bicycle pattern; two lights shall be placed in front of the vehicle and one red light in the rear. These lamps shall be lighted not later than 5 p. m.

Art. 11. Each vehicle shall be provided with a trumpet, fog-horn or other signal capable of sounding a warning signal of approach.

Art. 12. When two vehicles going in the same direction and at different rates of speed find themselves in proximity the slower one must keep to the right and leave half of the road available. Any vehicle attempting to prevent by maneuver the passage of any other vehicle will be disqualified. The umpire on the vehicle will be expected to enforce this condition.

Art. 13. The ordinary rules of the road must be observed by all vehicles, and in meeting ordinary vehicles it is expected that care will be exercised to ensure proper safety to the ordinary transients.

Art. 14. Any civil or penal responsibilities must rest entirely with the contestants who incur them. The judges, umpires or referees assume no responsibility of any nature whatsoever.

Art. 15. If several vehicles arrive together, or successively in front of an obstacle which necessitates the stoppage of the first vehicle, the other vehicles must stop in their order without attempting to pass each other till a distance beyond the obstacle of one hundred yards has been covered.

Art. 16. The umpire of the first vehicle to reach the obstacle shall have the ruling power.

Art. 17. The umpire of each vehicle will take the time of arrival at an obstruction and the time of its removal. This time shall be reported to the judges.

Art. 18. In no case may two vehicles move along abreast of each other in a trial of speed. A vehicle wishing to maintain its position must do so before proximity necessitates the surrender of right of way as per article 22.

Art. 19. The awards will be made upon the conditions of—first, utility, adaptability, excellence of design, cost and economy of operation. Second, speed.

Art. 20. No vehicle will be admitted to the competition unless the safety of occupants, spectators, and users of the public highways will be insured.

Art. 21. The judges reserve the right at their discretion to debar any vehicle which may contain elements either of danger or from its construction an evidence of weakness or general impracticability.

Art. 22. For the purpose of debarring any vehicle which may in the opinion of the judges contain elements sufficient for its rejection, preliminary trials will be held on October 29, 30, 31. All contestants must present their vehicles for examination in test as specified.

Art. 23. A detailed examination of the vehicle and its mechanism will be made by the judges and such experts as they may select. Tests will be made to determine the economy, efficiency, etc., of the vehicles, and it is expected that owners of the vehicles will offer every facility to the judges for this purpose.

Art. 24. Any vehicle which has taken part in the recent competitions held abroad will be allowed to compete in the contest provided, however, that it shall be optional with the judges as to whether detailed tests upon these vehicles are to be made.

Art. 25. Inasmuch as the preliminary trials may not involve the detailed test of efficiency and economy which would be an important criterion of merit, it is understood that any vehicle which shall compete in the contest shall be placed at the disposal of the judges for subsequent tests should they desire it.

Art 26. The subsequent tests of vehicles may be over such route and at such times as the judges may designate.

Art. 27. Every effort has been made by the judges to define the route, and direction posts have been placed to aid the conductors of vehicles. The conductor of the vehicle will be responsible for not following the route, and no claims will be allowed on account of delays or inconveniences experienced on account of mistaking the route. Conductors will be expected to familiarize themselves in advance, and thus avoid any trouble from these causes.

Art. 28. A time limit of thirteen hours will be set. Any vehicle failing to cover the route in thirteen hours, corrected time, will be disqualified. In computing the corrected time from the time of starting and of finishing, the reports of the umpires will be taken as to legitimate delays experienced upon the route.

Art. 29. Unavoidable obstacles, such as railroad trains at road crossings and other unusual obstructions in the roads, will constitute the only grounds for an allowance of time by the judges.

Art. 30. Delays experienced from imperfection of mechanism, break-downs, difficulties in starting, or similar causes, will not constitute grounds for time allowances.

Art. 31. Any repairs which may be required along the road must be executed by the occupants of the vehicle. Outside assistance will not be allowed, the umpires excepted.

Art. 32. Any infraction of these rules may disqualify a vehicle at the option of the judges. The judges also reserve the right to modify or amend these rules.

ENTRIES.

Arnold, B. J , Chicago; Andrews, A. B., Center Point, Iowa.; Ames, D. J., Owatonna, Minn ; Ames. A. C., South Chicago; Bradley, Wheeler & Co , Kansas City, Mo ; Bowman, E. West, Evanston, Ill.; Barrows, C. H., Willimantic, Conn.; Barcus, N., Columbus, Ohio; Brown, W. H., Cleveland, Ohio; Beck, C. W., Chicago; Chicago Fireproof Covering Co., H. C. Todd, Chicago; Chicago Carriage Motor Co , C. O. Hansen, Chicago; Cook & Gowdey, Chicago; Conklin, Oliver F., Dayton, Ohio; Carpenter, H. H., Chicago; Cross, E. D. (M. D.), Chicago; Cronholm & Stenwall, Chicago; Clapp, Henry W., Springfield, Mass ; Davis Gasolene Engine Co , Waterloo, Iowa ; Daley, M. H., Charles City, Iowa ; De Freet, Thomas M , Indianapolis; Duryea Motor Wagon Co., Springfield, Mass.; De la Vergne Refrigerating Machine Co , New York ; Elrick, George, Joliet, Ill ; Elston, R W., Charlevoix, Mich.; Feerrar, J. C. W., Lock Haven, Pa.; Gawley, T. R., Aurora, Neb ; Guilford, R. W , Auburn, Ind.; Hildebrand, J. A , Chicago; Hartley Power Supply Co., Chicago; Hertel, Max, Chicago; Hill & Cummins, Chicago; Hall, John W., & Sons, Jacksonville, Ill ; Haynes & Apperson, Indiana Natural Gas Co., Kokomo, Ind.; Hagaman, J. D., Adrian, Mich.; Holmes, Lyman S., Gloversville, N. Y.; Haviland, Frank W., N. Y.; Holton, Milton E., Chicago; Flachs, W. J. H., Quincy, Ill.; Lewis, George W., Chicago; Lasher, R. E., St. Louis, Mo.; Leppo Brothers, Belleville, Ohio; Laporte Carriage Co , Laporte, Ind ; Lowery, V. L. D., Eaton, Ill.; M'Donald, P E , & Brennan, W. F., Chicago; Alliance Carriage Co , Cincinnati, Ohio; Moehn, J. N., Milwaukee; Meredith, Edwin, Batavia, Ill.; Mills, M. B , Chicago; Morris & Salom, Philadelphia; M'Arthur, A. W., Rockford, Ill.; Mueller, H., Decatur, Ill ; Mills & Searls, Chicago; Maguire Power Generating Co., Chicago; Norton, Fred. G., Waukegan, Ill ; Praul, John E., Philadelphia; Pierce Engine Co., Racine, Wis.; Parks, W. J., (Ellinger & Parks), La Salle, Ill.; Patterson, William, Chicago; Pierce-Crouch Engine Co , New Brighton, Pa.; Pierce, W. A., Sistersville, W. Va.; Roberts, S. W., Chicago; Riel Import Co. (Benz motor), Chicago; Columbia Perambulator Co., Chicago; Robertson, G. W., Mount Vernon, Ind.; Radford, W. J., Oshkosh, Wis.; Strong & Gibbons, Chicago; Smith, Ira D., Pittsburg, Pa.; Stone & Maynard, Avonia, Pa.; Smith, Otis E , Hartford, Conn.; Shaver, Joseph, Milwaukee; Sturges Electric Motocycle, Co , Chicago; Schoening, C. J., Oak Park, Ill ; Sintz Gas Engine Co., Grand Rapids, Mich.; Schindler, A. J., Chicago; Templeton, John, Chicago; Thomas Kane & Co., Chicago; Taylor, Elwood E., Fitchburg, Mass ; Vanall, Frank, Vincennes, Ind ; Verret, N. J., Pine Bluff, Ark ; Woolverton, G. C., Buffalo, N. Y. ; Wayne Sulkyette & Road Cart Co., Decatur, Ill. ; Wilkins, Vernon H., Evanston, Ill ; Booth, Carlos C., Youngstown, Ohio; Okey, Perry, Columbus, Ohio; Simons, W. A. Chicago; Tinkham Cycle Co., N. Y. ; Wilson, David H. Chicago.

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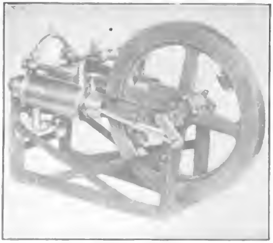

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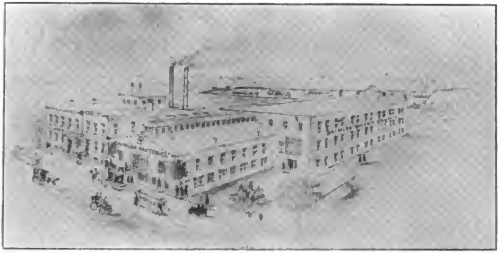

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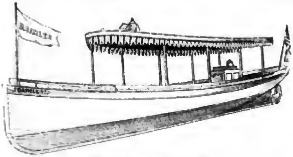

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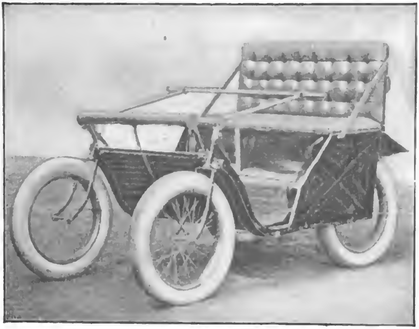

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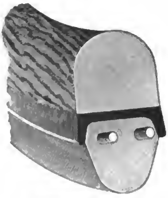

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A MONTHLY JOURNAL

DEVOTED TO MOTOR VEHICLE INTERESTS.

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Comparison Invited.

The full returns of the sale of the first number of The Horseless Age are not yet received, but those that are already in warrant the belief that the total sales will exceed those of the first number of any trade journal ever issued in America. Subscriptions have been coming in rapidly from all sections of the United States and Canada, and even foreign countries have thus early been heard from. These subscription returns show an astonishing diversity of interest. Physicians, lawyers, capitalists, bankers, promoters, mechanical and electrical engineers, gas engine manufacturers, machinists, bicycle, carriage, tube, and rubber tire manufacturers, inventors, college professors, intending purchasers, and manufacturers in lines too numerous to specify, are found upon the subscription lists of The Horseless Age. An interest so lively and a clientele so varied and so uniformly intelligent, have seldom responded to the slogan of the journalist; proving beyond peradventure that the brains of the American people is with those who are substituting better methods of locomotion for the horse.

It is the editor's intention to treat this great question in all its phases, and thus give to each and every class of subscribers the particular information they desire. The chemical branch of the subject is little understood, and is well worthy of special treatment. The mechanical department is wide enough to embrace nearly the entire Patent Office, while in its social and pleasure aspects the motor vehicle will afford no end of material both entertaining and instructive.

The judicious advertiser who is soliciting this new trade will appreciate the force of the claims advanced above, and remembering that it is the early bird that catches the worm, he will not be the last to utilize a medium which, within thirty days of its first issue, is read by thousands all over the United States.

The Status of the Race.

As a desideratum in modern locomotion, speed is of ever-growing importance. The pressure of the age demands it, and in response to that demand, steam cars and street cars now travel at rates of speed unknown a few years ago. Everywhere and in every line of effort, economy is the cry, and it is all for the easier attainment of human objects, and hence for the general amelioration of mankind.

But when we come to consider the motor vehicle in its present stage of development, the element of speed sinks into relative unimportance. Other considerations, such as simplicity, economy of operation, ease of control, etc., are entitled to much greater weight. A motor vehicle may attain great speed, and yet be practically worthless for the ordinary purposes of everyday use.

At some future day, when roads are universally good and motor vehicles are no longer a novelty; when people are accustomed to managing them and taking them into account as a factor of danger in street life, high rates of speed will be permissible, where road conditions are favorable; but for the present it is neither necessary nor desirable. Legal measures, limiting the speed of motor vehicles, are as much needed as measures regulating the speed of bicycles and horse-drawn conveyances, and for the same reason, namely, the public safety.

Hence, while recognizing the great stimulus which such motor vehicle contests as those organized abroad and at Chicago undoubtedly give to the new industry, the editor deems it wise to caution the public against laying too much stress upon mere speed. Races, or their results rather, partake of the vast and the extraordinary, and are surrounded with all the glamour which human admiration for these qualities can lend them. They arouse enthusiasm, prompt men to great exertion, and the million-tongued press recounts the story round the world. All this is helpful and necessary to the rapid growth of any great improvement at the present time. To lead, to educate and stimulate the public for the adoption of better things, is one of the most useful functions of the press.

But it must not be forgotten that the motor vehicle is offered as a substitute for the horse in the ordinary affairs of life, and not on the race track. What is wanted is a motor vehicle as responsive and tractable as a horse, and more economical in its maintenance. In the daily business of the world the speed of the horse cuts a small figure. It is power and docility combined that make him the useful animal he is to-day; and so in the case of the motor vehicle we must have power *and* control. Of the two phases of the question, if one is of more consequence than the other, it is control.

"The Bloodless Revolution."

SUCH is the bold phrase in which Sir David Salomons, an English savant and motor vehicle enthusiast, recently characterized the coming displacement of the horse. Sir David is himself a lover and breeder of fine horses, and his turnouts are famed throughout the whole of England. Yet to advertise to the world his own belief in "the horseless age," he organized a motor vehicle show last month at Tunbridge Wells, of which city he is the respected Mayor. The exhibition attracted wide notice from the British and continental press and was so largely attended by our conservative English cousins that those who are skilled in reading the signs of the times see unmistakable evidence of a new fad in upper class society there.

That England, long the mainstay and buttress of conservatism; England, where to-day a motor bicycle is treated on a par with a traction engine in road legislation—should evince so sudden and pronounced an interest in the new vehicle is significant indeed. It affords cumulative proof of the unprecedented rapidity with which this burning question of the day is spreading over the civilized world. The wave is upon us in America to-day, and almost before the public is aware, as by a sweep of Aladdin's wand, steedless wagons will be gliding through the streets in varied forms, for varied uses.

To in some degree mitigate this surprise and prepare the public for the impending change, is the mission of THE HORSELESS AGE.

Looking for a Name.

ST. PAUL, the apostle, said that the generation of his day sought after a sign, but that no sign should be given them. In like manner the very estimable gentlemen who are organizing the American Motor League are looking for a name, but it is very doubtful whether they will be more successful in their search than the generation of St. Paul was. They are seeking what they already have, if they will but see it.

It is certainly advisable for those who are pioneering a new industry to be careful in the selection of their terms, and thus endeavor to secure the popular adoption of those terms which are best suited to express their ideas. But after all, the naming of things is the prerogative of the people, and before this democratic bar all verbal candidates must finally be tried. The standard by which these words will be judged is fitness—fitness for the everyday business of life.

But in considering the choice of a name for the vehicle without horses, we are confronted at the outset with the fact that this class of vehicle is not new; it is only the interest in them which is new. For thirty-five or forty years past the United States Patent Office has been granting patents on contrivances of this kind. So numerous have the applications been that long ago a distinct classification was adopted for them—"motor vehicles,"—and under this one heading are grouped all the various forms of minor vehicles without horses, using other than man power.

If the objection be raised that this also includes street cars, it may be answered that the tendency for some time past has been to limit the term to trackless vehicles, such as wagons, bicycles, etc., a distinction which is becoming more marked every day, and is likely to be clearly defined within six months.

The examiners of the Patent Office are surely as well qualified to choose the proper terms for mechanical inventions as anybody, having during the past twenty-five years come directly in contact with hundreds of inventors, and being familiar with all the differences and distinctions observable in this particular class of invention.

Given the term motor vehicle, therefore, as a generic or general term, all the specific terms needed follow easily and naturally from it. We have our motor bicycles, tricycles, buggies, wagons, trucks, traps, phaetons, carriages and what not, and if it is desired to specify the nature of the motor which propels the vehicle, we can subdivide the generic class from this point of view into electric, gasolene, kerosene, acetylene, etc., bicycles, buggies, carriages, wagons, etc.

This method of classification is logical and simple, for by the union of two known terms we proceed to the unknown, or the new, a very easy transition in language as in knowledge.

At present the people seem to be wedded to the name "horseless carriage," but with the growing importance of the motor interests in modern civilization, it seems quite certain that this awkward expression will gradually be discarded in favor of the briefer, more terse and expressive terms above mentioned.

The editor of THE HORSELESS AGE has adopted this terminology as the simplest and best, and will continue to employ it, unless forced by popular usage to abandon it.

In the popularization of this comprehensive motor idea, and the substitution of a more sensible terminology for that now in vogue, the American Motor League can lend efficient aid.

◆

Acknowledgments to the Press.

THE editor desires to express his appreciation of the many favorable comments which have been made by the press of the country on the first number of THE HORSELESS AGE. The newspapers have as a rule shown a quick perception of the situation, and will doubtless render great assistance to the cause in future by giving to it liberally of their space. It is a subject of great interest to their readers, and its treatment is therefore in line with good journalistic policy, as well as in harmony with the broad tendencies of the age.

A few editors who read the title but not the contents of the book, fell into a skeptical or even satirical frame of mind, and afforded striking illustrations of the old adage that a little knowledge is a dangerous thing. Having denied themselves the abundant evidence offered in its pages, they could not be expected to arrive at correct conclusions. That magnificent progress is recorded in the first issue of THE HORSELESS AGE, only candor and a willingness to read are needed to recognize.

It is better to be right than to be funny, and it is impossible to intelligently discuss a great mechanical improvement like the motor vehicle without a clear discernment of that guiding principle of human nature, by which a man goes cross lots when he can, instead of around the corner.

◆

In its tenacity of established things, the world is very much like a child hugging a cherished toy. It strenuously resists anyone who would deprive it of an old custom, but is quickly consoled with a new one.

◆

Thos. A. Edison's Views on Motor Carriages.

THE New York *World* of Sunday, November 17th, contains a lengthy interview with Thomas A. Edison, in which the famous inventor discusses a number of topics now prominently before the public, including motor carriages. The Wizard says:

> "Talking of horseless vehicles, by the way, suggests to my mind that the horse is doomed, yet this animal shows a greater economy of force than man, for 70 per cent. of the energy of the horse is available for work. But the horseless vehicle is the coming wonder.
>
> "The bicycle, which ten years ago was a curiosity, is now a necessity. It is found everywhere.
>
> "Ten years from now you will be able to buy a horseless vehicle for what you would have to pay to-day for a wagon and a pair of horses. The money spent in the keep of the horses will be saved, and the danger to life will be much reduced."
>
> "Will these vehicles be run by electricity?"
>
> "I don't think so," said Mr. Edison. "As it looks at present it would seem more likely that they will be run by a gasolene or naphtha motor of some kind. It is quite possible, however, that an electrical storage battery will be discovered which will prove more economical, but at present the gasolene or naphtha motor looks more promising.
>
> "It is only a question of a short time when the carriages and trucks of every large city will be run with motors. The expense of keeping and feeding horses in a great city like New York is very great, and all this will be done away with, just as the cable and trolley cars have dispensed with horses.
>
> "You must remember that every invention of this kind which is made adds to the general wealth by introducing a system of greater economy of force. A great invention which facilitates commerce enriches a country just as much as the discovery of vast hoards of gold."

With the main drift of Mr. Edison's remarks we most heartily coincide, but when he postpones the day when a motor carriage can be bought at a price now paid for a carriage and pair of horses until the next century, he forgets the recent wonderful development of electrical science, in which he himself has played so important a part, and shows that he is not aware of the amount of intellectual energy that is being concentrated upon the motor vehicle problem in America to-day.

Had Mr. Edison read the first number of THE HORSELESS AGE, he would have said ten months rather than ten years.

The Policy of the Motor League.

AT THE MEETING held in Chicago, November 1st, the organizers of the American Motor League failed to agree as to the policy the organization should follow in the admission of members, and a committee was accordingly appointed to give the subject more careful consideration and report at the next meeting.

Some were in favor of admitting users of motor vehicles as well as manufacturers and scientific experts, but others wished the membership limited to the latter only.

In the initial stages of a great industrial revolution such as we are about to see, opposition is sure to be encountered from many quarters. The interests arrayed against the reform are always potent for mischief, controlling many public offices and furnishing the animus of many laws directed against the new comer. Their ever-ready argument which gains for them many unthinking adherents, and the truth of which must be admitted, is that the innovation is ruining their business.

Now, it is well known that the only way to successfully meet organized opposition is by organized opposition. The army of the conservatives must be confronted and overawed by an equally numerous and more determined army of progressives. There is immense power in numbers and there is immense power in determination, and both these weapons should be used to the fullest extent.

But it is obvious, at this period of the industry, that the inventors and manufacturers of motor vehicles constitute but a small fraction of those who are or will soon be working against them. Hence the necessity of bringing into the organization all users of motor vehicles in order to swell the ranks and stand shoulder to shoulder in the protective work which will undoubtedly be needed from the start. With respect to loyalty to the cause, it will probably be found that users of motor vehicles do not suffer by comparison with manufacturers or experts. In the pioneer days enthusiasm is rife, interests (many of them) are common, numbers are needed, and the door should be open wide enough for all who are sufficiently interested to enter. A good representation of users will at once demonstrate the practical utility of the invention, and frustrate any claim that "the people" are antagonistic to it.

Organizations, like individuals, change according to their environment and the functions that they perform. In the aggressive period the protective feature naturally assumes great prominence, but as the necessity for protection disappear so the protective feature would quietly lapse and members who had joined solely for this object would sever their connection with the organization or become inactive. Simultaneously with the decay of this function others that had previously been in abeyance would begin to develop.

The educational value of the Motor League will certainly be great, if it is conducted on broad and liberal lines. In the last issue of the L. A. W. Bulletin, Mr. Sterling Elliott seems to brand this idea as chimerical, and ironically asks us to imagine, if we can, the bicycle manufacturers coming together into convention and revealing their secrets to each other.

Whether it is possible for the bicycle manufacturers to come together for the exchange of ideas it is not necessary to consider here at length, but it is necessary, for a clear understanding of the matter under discussion to point out some radical differences between the bicycle and the motor vehicle trades to-day.

The bicycle trade as compared with the motor trade is old. Its members have passed through the period of enthusiasm. Competition begins to be felt more keenly and the jealousies that spring from it tend to close men's minds and make them uncommunicative. But the motor vehicle inventors are full of hope and buoyancy. They are able to forget themselves in the idea which they represent and which has taken complete possession of them. In this state of mind men are not, as a rule, secretive. They are glad to meet each other and exchange ideas and he must be a dullard indeed who, from a conversation with a knot of fellow inventors, or from a more formal gathering for the same purpose, cannot carry away some suggestion helpful to himself.

And it goes without saying that he who knows most will learn most from such a gathering, and he who knows everything will learn nothing. Neither the bicycle manufactures nor any other class of men however engaged, are too old or too wise to profit by association and interchange of ideas.

Even the social features of trade organizations are not to be minimized. They smooth down the little roughnesses of competition, give men juster views of their fellows, foster a common interest, broaden the minds and quicken the sympathies of their members. These are influences not to be despised, and even if the American Motor League could accomplish no more than this it would have good reason to exist. But it can accomplish more. It has much and varied work to do, work in which all earnest men should be invited to join.

◆

Uniform Spelling.

THERE seems to be no good reason why benzene and gasolene should be spelled with an i, in the termination, as they commonly are to-day, while acetylene and kerosene take the e. Hence the editor of THE HORSELESS AGE has decided hereafter to adopt the uniform phonetic spelling "ene" for all these names of hydrocarbons.

What It Means to the Cripple.

THERE is a class of the community little thought of perhaps in the prevailing excitement, who are looking forward with anxious hope to the final success of the present motor vehicle experiments. These are the cripples and paralytics, who retain the use of their arms, but have no control over their lower members. A light, reliable and safe motor tricycle or quadricycle, which they might operate without change of position, would open up a new world for them. It would not only enable many of them to get about without assistance, but it would afford pleasant and diverting exercise, which could not but have a favorable influence upon their health.

The editor of THE HORSELESS AGE has had inquiries from a number of such sufferers, and hopes the day is not far distant when the manufacturers of motor vehicles will be able to supply their wants.

◆

The Soulless Machine and the Spirited Animal.

THE people who tell us the motor wagon will never displace the horse because the one is a "soulless machine" while the other is a spirited animal, have been reading romances of the days of chivalry or attending Horse Shows, and never opened their eyes on the work-a-day world. Hard work is the lot of most horses, and any spirit they naturally possess is soon subdued. As for pet horses, they are a special and not numerous class, and will not be disturbed.

◆

Aid from the Cartoonists.

ANYTHING new comes as a godsend to the cartoonists, who must be continually feeding the public appetite for the humorous. Hence it is not surprising to see the motor wagon caught up by them with avidity and made the central idea in many of their current sketches.

The past month it was used to good advantage in a two-page cartoon by one of the leading comic papers of the country.

The artists are lending their influence in the right direction and we welcome them as aiders and abettors in the popularizing of a great public improvement.

◆

"Hands Across the Sea."

TO OUR CONFRERE, the editor of *La Locomotion Automobile*, published at Paris, France, we extend the right hand of fellowship, and if we should at any time forget to credit matter taken from his pages, it will not be because it is not worthy of credit.

Motor Convention at London.

SIR DAVID SALOMONS, the English motor vehicle enthusiast, has received such an avalanche of correspondence since he held his exhibition at Tunbridge Wells, that he has decided to call a meeting at London in the near future, to consider the question of self-propelled traffic, and influence legislation in its behalf.

◆

"It Scares Horses."

SUPPOSE it does. So do locomotives, bicycles, street cars, Fourth of July celebrations, and a dozen other things. Horses must get used to it.

The Touring Club of France.

Few Americans are aware of the extent of this fashionable organization, whose headquarters are at Paris, and whose members are found in every province of the Republic. Over 20,000 names are already to be counted in its membership roll, and the enthusiasm for touring in the new automobiles is increasing so fast, that the club bids fair to excel in members and influence all other French societies.

Delightful descriptions come to us across the water of holidays gliding away on wheels, mid the picturesque scenery of Provence, Burgundy, Champagne and other famous provinces of "Sunny France." Its motto seems to be *bon camaraderie*, and it is doing good work for the cause of the automobile.

As though this collossal society were not sufficient, Count de Dion now suggests that an Automobile Club be organized at Paris, one of whose chief objects shall be the establishment in the suburbs and outlying districts of inns or road houses, where all the necessary supplies for man and vehicle can be obtained.

◆

British Columbia to the Front.

It is said that a company is being formed, with $500,000 capital, to operate a line of motor wagons between Ashcroft and Barkerville, B. C., a distance of some two hundred miles. Ashcroft is on the line of railway, and Barkerville is in the heart of the gold region. There is a fine wagon road the whole length of the route, and at present a big business is being done by horse stage lines. But in the Cariboo country everything the horses eat has to be imported at a heavy expense, and the road runs through such a mountainous region the horses do not last long. The company thinks it can handle the business of both passengers and freight, including the ore output of the mines, by using an oil motor wagon designed for this route, and at a much cheaper rate than by the present horse stages. The Provincial Legislature has been asked to pass a bill granting the company the privilege of operating motor wagons on all the main routes in the Cariboo region. By Government direction the wagons are to be constructed with extra wide tires in order that their use may be beneficial to the roads.

Motor Vehicle Show at Tunbridge Wells, England

English Horses Show no Fright.

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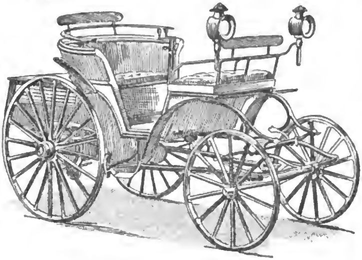
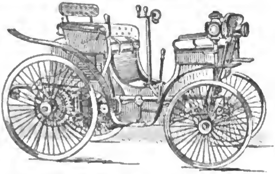
Remarkable evidence of the widespread and growing interest which is felt in the development of mechanical-power carriages and cycles was afforded at the exhibition of horseless carriages organized by Sir David Salomons yesterday at Tunbridge Wells. All the visitors now staying at the bright little inland watering-place appeared to have crowded to the Agricultural Show ground, and in addition the trains had brought shoals of interested spectators from London and all parts of the country. That a good many cyclists are looking forward to the time when they will be able to indulge in their favorite pastime without exercising their muscles, was evidenced by the long row of bicycles which lined the hedge on one side of the ground; and the large number of one-horse and pair-horse carriages which surrounded the meadow seemed to show that in the world of fashion there is no small desire to reduce the expense of living by means of a mechanical substitute for the horse.

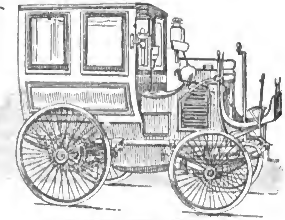


PETROLEUM VIS-A-VIS. M. ROGER, PARIS.

The number of vehicles shown was not large, but Sir David was justified in claiming that it was fairly representative. With one exception all the carriages were of French manufacture and design, and as the only example of British enterprise in this direction was not seen at work, it is impossible to institute a comparison between French and English work; but in appearance at least it justified the hope that when the present absurd legal restrictions are removed, we shall be able to hold our own with our neighbors. The carriages which excited the greatest admiration were a *vis-à vis* built by Messrs. Peugeot, of Paris, and a tricycle, worked by petroleum motor, with electric spark ignition, shown by Messrs. de Dion & Bouton, of Paris. The *vis-à-vis*, which is worked by a Daimler petroleum engine supplied by Messrs. Panhard & Lavassor, was exhibited by Sir David Salomons. It weighs 13 cwt., and will run from 180 to 200 miles without recharging. It carries four persons, and although to the spectator there appeared to be an unpleasant amount of vibration, those who were privileged to ride in it—including two or three eminent physicians and scientists—expressed themselves exceedingly pleased with its working. The tricycle, which was built from the design of the Count de Dion & M. Bouton, both of whom were present at the exhibition, appeared to work exceedingly smoothly. It is provided with pedals, and it appeared to require a certain amount of assistance from the rider's legs when going up-hill; but this was probably due to the fact that the course consisted of more or less sodden meadow land. Its weight is 95 lbs., and its cost, $250. A carriage built by Messrs. Panhard & Lavassor, and worked with their Daimler petroleum engine, was shown by the Hon. Evelyn Ellis. Though different in shape, it was precisely the same in principle as Sir David Salomons' exhibit. Very different, however, was the carriage with steam-horse attached, shown by Messrs. de Dion & Bouton It was undoubtedly the most powerful horseless carriage shown; but although the smoke had been kept in perfect subjection the occasional clouds of steam and the noise rendered it apparently a much less agreeable carriage than those worked by petroleum engines. Mr. Evelyn Ellis also exhibited a fire-engine for a country house fitted with the Daimler engine. It was shown at work, throwing a column of water to a height quite sufficient to reach the top of a three-storied house.

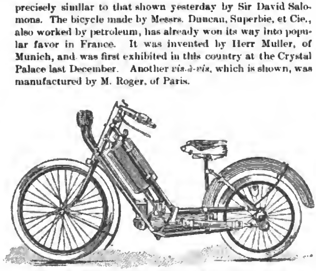


DAIMLER CARRIAGE. PEUGEOT FRERES, PARIS.



DAIMLER OMNIBUS, PUEGEOT FRERES, PARIS.

Four types of carriages worked by petroleum engines, all of which have already come into pretty extensive use in France, are shown in the accompanying illustrations. Three of them—the omnibus, the brake, and the "*vis-à-vis* à quatre places"—were manufactured by Messrs. Peugeot, the last named being precisely similar to that shown yesterday by Sir David Salomons. The bicycle made by Messrs. Duncan, Superbie, et Cie., also worked by petroleum, has already won its way into popular favor in France. It was invented by Herr Muller, of Munich, and was first exhibited in this country at the Crystal Palace last December. Another *vis-à-vis*, which is shown, was manufactured by M. Roger, of Paris.



PETROLEUM BICYCLETTE. DUNCAN & SUPERBIE, PARIS.

Sir David, who explained the mechanism of his carriage, stated that the average speed was eight miles an hour, although on good roads he had traveled at the rate of twenty miles an hour. The fuel is benzene, costing 22 cents a gallon, and the cost of running the carriage is about one-third of an English penny per mile. The vehicle cost $1,350.

Among those present on the ground was Shaw Lefevre, who when president of the local government board in the late parliament, introduced a bill to remove the legal restrictions dealing with steam and other vehicles not propelled by horses. The bill, unfortunately dropped with the defeat of the government, but is certain to be taken up in the near future.

That the horseless carriage for use on ordinary roads is no new idea, may be gathered from a steam vehicle of the kind, invented by Mr. Gouldsworthy Gurney, and shown at work in Regent's Park in the year 1827. It was found however, that when coke and water had been provided sufficient to last for an hour's trip there was very little room left for passengers.

The length of the vehicle was 15 feet, and with the pole and pilot wheels, 20 feet. The diameter of the rear wheels was 5 feet, and of the front wheels 6 feet 9 inches, and of the pilot wheels 3 feet. One curious arrangement was a set of "steppers" which moved like the legs of a horse, and were used in going up-hill.

An interesting fact which has been omitted in many reports of this exhibition, is that when these vehicles were afterwards taken out for a short run on the public highways, they did not appear to frighten the staid English equines in the least, although the road was crowded with vehicles of all description. Thus, this protective measure in favor of horses seems to be entirely uncalled for. It is the English men who are frightened, and not the English horses.—*London Daily Graphic, Oct. 16th.*

* * *

Signor Brena has arrived at Bologna from Naples in his automobile carriage, having completed 3,000 kilometers of his journey. The carriage is said to be none the worse, though it went over terribly bad and rough roads, and had to pass through the snow which was encountered while crossing over the Apennines, at the Piano delle Cinque Miglia—*The London Daily News.*

A FEW PRESS COMMENTS

ON

THE HORSELESS AGE.

We are getting on rapidly. A new monthly publication just started in New York, is styled The Horseless Age. It is devoted to the interests of the motor vehicle industry. The numbers and variety of motor vehicles described in the first number of the paper is surprising to one who has not kept up with the recent achievements of inventors. With so many men at work on the problem, and in view of the results already achieved, there can be little doubt that in most of its uses in civilized countries the horse is doomed.—*Indianapolis News.*

Although horseless carriages have only recently attracted public attention, yet the interest in them is already very extensive, and an immense amount of inventive ingenuity is being applied to their construction. On September 1, there were on file at Washington over 500 applications for patents on vehicle motors, and over 300 different types of motor vehicles have been built or are in course of construction. The interest has become so large that it already has its trade organ. The publication has begun in New York of The Horseless Age, a monthly journal devoted to the interests of the motor vehicle industry.

It will doubtless be a long time yet before a horse will be as extinct an animal as the dodo, in the streets of a city, as an enthusiast has predicted, but it is at least certain that the practicability of motor vehicles has been demonstrated, and that their introduction into general use is an event of the near future.—*Pittsburg Chronicle Telegraph.*

So great is the attention now being giving to the horseless vehicle that a new paper known as The Horseless Age, has been established in New York, and a study of its pages shows an astonishingly large number of vehicles already constructed and ready to seek public favor. The revolution which this industry threatens to work in transportation of people and freight is an interesting study.—*Manufacturer's Record, Baltimore.*

The very latest is Vol. 1, No. 1, of The Horseless Age, "a monthly journal devoted to the interests of the motor vehicle industry." It is published by E. P. Ingersoll, 157 William St., New York city, at $2 a year. The first issue contains pictures of a surprisingly large number of "horseless carriages" already in existence in the United States.—*Homestead, Springfield, Mass.*

The interest in the horseless carriage has developed so gradually that but few folk, outside of those who have followed the subject, fully realize the advance which has been made in the direction of providing means of travel without the aid of horses. The energy of inventors has been directed so vigorously toward finding a substitute for horses and bicycles and steam, that an enterprising publisher in New York City has put in print the first number of a monthly magazine known as The Horseless Age. The first number contains many illustrations of designs for horseless vehicles and bicycles run by electricity and other agencies.—*Wilmington (Del.) News.*

The motocycle now has an advocate and exponent in The Horseless Age, an illustrated quarto-magazine issued monthly by E. P. Ingersoll, 157-159 William Street, New York city. No fewer than thirty-six horseless carriages are illustrated, together with several pedalless bicycles and tricycles, plans of the electric or oil engines employed as the propelling power, and other details of the *fin de siecle* vehicle.—*Milwaukee Sentinel.*

Among the new technical magazines published is The Horseless Age, which is a revelation in the new modes of locomotion which ignore alike pedestrianism and the patient and faithful friend of man. In it all sorts of devices for covering the maximum of distance in the minimum of time are described and lucidly illustrated. The motor vehicle has come to stay, and so it is to be hoped has its representative magazine. E. P. Ingersoll, publisher, 157 William Street, New York.—*Pittsburg Press.*

The initial number of The Horseless Age, a monthly journal devoted to the interests of the motor vehicle industry, published by E. P. Ingersoll, at 157-159 William Street, New York, is a handsomely printed pamphlet of some 50 pages, illustrated with numerous views of the peculiar class of vehicles which are now rapidly coming into use. It will doubtless prove an acceptable periodical to those who are watching the progress of this new development in the modes of travel, and will serve to keep the new inventions in this line before the public in a thoroughly systematic and pleasing manner.—*Waterbury American.*

That motor carriage riding is a pleasure within the possibilities of the present day is forced upon our attention by the appearance of a new trade journal, devoted to the interests of the motor vehicle industry. This is somewhat startling, inasmuch as the motor vehicles have but just made their appearance in this country. The popular mind had scarcely become accustomed to the substitution of electric or other motors for horses on street cars, when it is asked to adjust itself to a new order of things and prepare to see the horse still further deprived of the opportunites of earning an honest livelihood.

But it is difficult to startle the inhabitants of this age by any novelties and the mind is always ready for any new development. There has been a contest of motor vehicles in Chicago recently and now comes this new aspirant for journalistic honor, The Horseless Age, with its story of new developments and the message of doom for the horse. The editor of this periodical admits at the outset that the appearance of a journal devoted to a branch of industry that is yet in an embryonic state may strike some as premature. That such an opinion might be generally formed is natural. There is no motor vehicle industry in sight yet, although there are one or two manufactories springing up in this country which have for their object the manufacture of such vehicles. But the editor is a true American and belives in getting upon the ground early. His faith in the possibilities of this horseless age is great and he knows that the first in the field has the best chance. There is a great industry struggling into being here, he thinks, and all signs point to the motor vehicle as the necessary sequence of methods of locomotion already established and approved. The growing needs of our civilization demand it; the public believe in it and await with lively interest its practical application to the daily business of the world. The man who can anticipate this industry and get a trade journal established before the trade itself is on its feet is a hustler and is entitled to distinction in this age of hustlers.—*Rochester (N. Y.) Register.*

The motor vehicle industry has already advanced so far as to call for the publication of an organ, and the first number of volume 1, of The Horseless Age has been received. It contains a very large number of photographs and diagrams of various horseless wagons, driven by gasolene, petroleum, steam, and electricity, which are in various stages of perfection, with descriptions of the same. It is shown that the industry of producing motor vehicles is in a much more advanced stage than is generally supposed, and at least one company promises to be ready by the spring of 1896, to supply the market with different styles of horseless wagons. New York: E. P. Ingersoll, No. 157 William Street.—*Buffalo Courier.*

The Horseless Age is the name of a new monthly publication just started in New York, at 157 William Street, by E. P. Ingersoll. As its name indicates, it is devoted to the interests of the motor vehicle industry. The motor vehicle must have good roads. The more people become interested in the one the more they will clamor for the other, hence we hail with earnest joy The Horseless Age, and hope it "may live to eat the hen that scratches over its grave."—*L. A. W. Bulletin, Boston.*

The Horseless Age is a new periodical devoted to the interests of the motor vehicle industry, published by E. P. Ingersoll, at 157-159 William Street, New York. Most people will be surprised to learn that this industry has attained proportions entitling it to an organ of this character and much may be learned by studying it.—*Bedford Standard.*

The Horseless Age is the name of a bright, clean looking and interesting monthly, devoted to the motor vehicle industry. Its publisher is Mr. E. P. Ingersoll, a well-known journalist, with headquarters at 157-159 William Street, New York. The first issue, that for November, is full of good matter, and may be regarded as a review of the new art as it stands at this moment. There are 56 pages of text and advertisements, and the large variety of articles is profusely illustrated. Mr. Ingersoll, as the pioneer journalist in this field deserves a handsome reward, and makes a strong bid for it. We shall watch his progress with much interest.—*Electrical Engineer, New York.*

The horseless age has made its advent, although it is too much to say that in the horseless age there will be absolutely no horses. We should deeply regret to think of the extinction of so noble an animal as the horse; so long the companion and friend and useful servitor of man. But that the age in which both freight and pleasure vehicles will be propelled by electricity or some other motive force, is now within sight is very certain. The motocycle is among us, and has come to stay.—*Newark (N. J.) Advertiser.*

Motor Wagons for the Army.

One of the most interesting of Gen. Mile's recommendations is that a force equal to one full regiment of twelve companies be equipped with bicycles and motor wagons. More than 4,000 officers and men, he says, can use the bicycle, and from them the required twelve companies could be picked and transferred. Such a plan would carry the wheel and the motor wagon to a use in our army far beyond what is known in any other, proportionally to the whole force.

The Trial and Postponement.

Brief Review of the Preliminary Tests and the Consolation Race.

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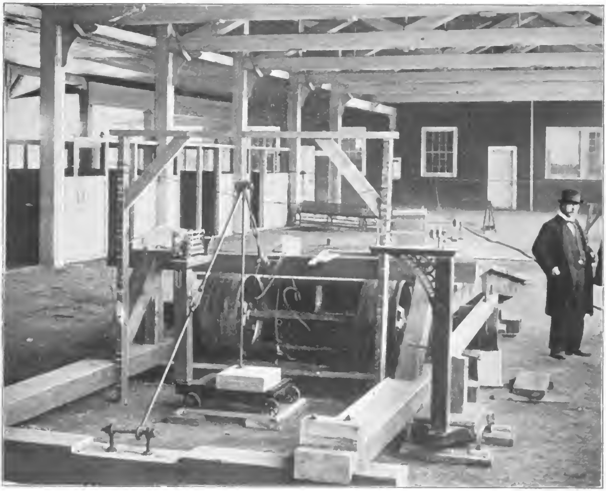
Owing to a general feeling among those who had entered in the *Times-Herald* Contest that insufficient time had been allowed them for preparation, the judges wisely decided to postpone the event until Thanksgiving Day, November 28th. Only eight vehicles could be mustered on the Washington Driving Park on Friday, the day before the race, and one or two of these were in an unfinished condition. They were: The Benz wagon, imported from Mannheim, Germany, and owned by the H. Mueller Mfg Co., Decatur, Ill.; the Duryea wagon, of the Duryea Motor Wagon Co., Springfield, Mass.; two electric wagons built by Morris & Salom, Philadelphia, Pa.; a motor bicycle and two victorias entered by Thos. Kane & Co., Chicago, Ill., and an unfinished electric wagon exhibited by the Columbia Perambulator Co., Chicago, Ill.



APPARATUS FOR TESTING MOTOR VEHICLES. L. L. SUMMERS & JOHN LUNDIE, CHICAGO, ILL.

A large crowd of experts and curiosity seekers gathered around these vehicles as they were put through their paces on the track, some of those present having come from remote points to witness the exhibition.

THE TESTING APPARATUS.

A unique testing apparatus had been set up at the Park and it was stipulated in the rules of the contest that each vehicle should be subjected to this test before being allowed to compete in the Race. Three vehicles only were put through the ordeal, the Benz wagon, the Duryea, and one of the victorias of Thomas Kane & Co. The figures of these tests were not given out however, the judges having decided to reserve them until the publication of the complete tests, which are to be made previous to the Thanksgiving Day event.

The machine adopted consists of a raised platform with an incline leading to it, permitting the motocycle to be run upon the platform without difficulty. Immediately in the rear of the platform is a shaft containing two revolving drums and a friction brake. The friction brake is a standard dynamometer and registers accurately the power consumed by the revolving drums and shaft. The vehicle is also attached to the platform through a dynamometer, which registers accurately the pull it exerts. Revolution counters are attached to the revolving wheels and drums, so that the speed at which the wheels travel is accurately measured at all times.

The weight of the vehicle causes the wheels to adhere to the revolving drums, and the friction is sufficient to tend to drive the vehicle forward as it would upon an ordinary road. This friction is adjustable and is measured, so that the vehicle may run at full speed and its forward pull be measured, also the number of miles per hour it would travel. With this device it is possible to measure the load the vehicle will carry, how steep a grade it will climb, the consumption of fuel, the power and the efficiency of the mechanism.

BENZ MOTOR WAGON. OWNED BY H. MUELLER MFG. CO., DECATUR, ILL.

What is termed rolling friction enters largely into the problem. This term simply means the friction the road has for the wheel of the vehicle. The road tends to sink slightly under the weight of the wheel, and in doing so forces the wheel to climb a small hill in order to move forward. This small hill is made at every new position assumed by the vehicle, and consequently there is a continual expenditure of power in forcing the carriage forward. The amount of pull required to draw the vehicle along varies with the depth the wheels sink into the road.

In railway work where the road is steel and the wheels are also of hard metal, the rolling friction is small in connection with the bearing friction. It requires from eight to ten pounds pull to move a ton of weight on ordinary roads. This will amount to from forty to 100 pounds, depending on the wheels and on the road. Messrs. Summers and Lundie intend to determine this factor for various roads, and also the friction of the axles, wheels, shafts, etc., of the motor vehicles.

THE CONSOLATION RACE.

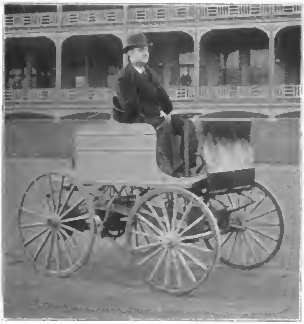
The great race was postponed, but in order to afford those who had responded to the muster a chance to win some laurels, the judges announced on Friday, November 1st, a consolation race, to be run over the course the following day, with a prize of $500, for the winner, or winners, if more than one vehicle covered the course. The time limit was fixed at thirteen hours.

At 8.15 o'clock on November 2nd, four vehicles assembled for the start at the junction of the Midway Plaisance and Jackson Park. These vehicles were the Duryea motor wagon, the Benz wagon—of the H. Mueller Mfg Co., and two Kane-Pennington victorias. The owners of the latter stated however that they had no intention of running over the course, but would merely exhibit their machines on the city boulevard.

Morris & Salom also exhibited their electric wagons at the start.

The Benz wagon was sent off first, followed after a brief interval by the Duryea wagon. Both wagons moved at a moderate speed until the corner of Halsted Street and the Fifty-fifth Street Boulevard was reached, when the race proper began. In the Benz wagon were seated Oscar Mueller, son of the owner, C. G. Reid, of Chicago, and S. F. Gilmore, of Princeton, Ind., who acted as umpire. Charles E. and J. Frank Duryea occupied their own vehicle. The Duryea wagon soon took the lead but lost it through the snapping of the drive chain, which was of too light construction. Forty-eight minutes were occupied in repairing this, the Benz wagon having meanwhile passed on and secured a good lead.

The Duryeas quickened pace in the effort to overtake their competitors and seemed likely to succeed when an unfortunate accident put them out of the race. A few miles out of the city they overtook a farmer, driving a team in the same direction. In his flurry the farmer turned to the left instead of the right, and to avoid a collision the Duryeas were forced into the ditch. The ditch was considerably deeper than appearances indicated and the shock broke one of the front wheels, completely disabling the wagon, which had to be shipped by train to Chicago.



ELECTRIC WAGON. COLUMBIA PERAMBULATOR CO., CHICAGO.

The Benz wagon proceeded over the course, an object of interest to thousands en route. Supplies of gasolene, and ice for cooling the machinery were taken at the appointed stations on the journey, and at 6.43, nine hours and thirty minutes from the time of starting, the Benz wagon reached the goal at Lincoln Park. The amount of gasolene consumed during the entire trip is said to have been five and a half pounds.

The distance covered was ninety-two miles and allowing for delays the actual time occupied in making the run was only eight hours and forty-four minutes.

The only other machine that attempted to cover the course having met with an accident, the judges awarded the special prize of $500 to the H. Mueller Mfg Co., of Decatur, Ill.

Messrs. L. L. Summers and John Lundie of the board of judges, made a rigid examination of the victorious machine as soon as it was brought to a standstill, and as a result made the following official statement:

"We made a careful examination of the motor at the end of its journey. There was no perceptible heating of any of the bearings. The cylinder was not unduly heated. The water jacket was not steaming and the last water which had been taken in was cool. The hard rubber tires were in first-class condition barring the one which had simply been misplaced by an unavoidable accident and which was restored to position without difficulty. The left hand rear wheel was slightly sprung. We found no cutting of the bearings from dust or grit. Although the belts used in connection with the machinery showed dust deposit, this had no injurious effect upon them. In fact, we found the machine in very good condition and it could have repeated the trip at once. It stood the test of the journey, with all of its hardships, in a magnificent manner."

"The number of miles actually run was ninety-two. The gross time taken by the Benz motor in travelling this distance was nine hours and thirty minutes. The start was at 9.13 Saturday morning and the finish at 6:43 in the evening. In making the run the only time delay allowed by the judges under the rules and conditions of the race was for stops at grade railroad crossings, where trains might temporarily block the way. The Benz machine lost seven minutes through this cause. The judges therefore corrected the running time from nine hours and thirty minutes to nine hours and twenty-two and a half minutes. This will be the official record of the length of time occupied, showing an average speed of approximately ten miles an hour.

But the machine lost other time than that at grade crossings. Its total loss of time was forty-six minutes, making its real running time for the entire distance eight hours and forty-four minutes. The time losses enumerated are:

	Time lost.
By sparking machine	2:00
By loss of tire	7:00
Adjusting tire second time	3:30
By sparking machine	2:30
Taking water	4:00
By sparking machine	3:30
Lost road by fault of bicycle guides	4:00
Taking supplies at Winnetka	5:00
Taking supplies at Wankegan	7:00
Loss at grade crossings	7:30
Total	46:00

The great race for the $5,000 prizes is positively announced for Thanksgiving Day, the judges declaring that no climatic conditions or pleas for more time will influence them to postpone it. Should the weather prove too inclement to permit a race over the new sixty mile course, the competition will take place in some suitable enclosure like Tattersall's.

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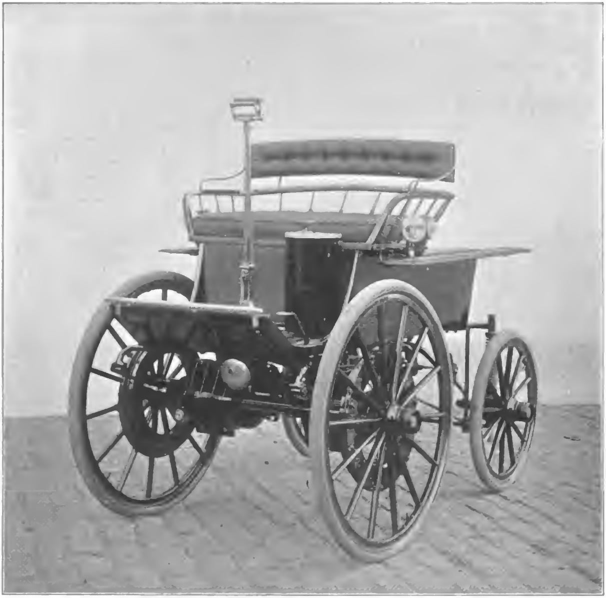
The "Electrobats."

Pedro G. Salom, electrician, and Henry G. Morris, mechanical engineer, of Philadelphia, exhibit three electric vehicles which they have christened "Electrobats," a compound derived from the Greek, and meaning a conveyance or means of locomotion which derives its power from electricity. These vehicles are of widely differing types, and all are models of the carriage builder's art.



"ELECTROBAT." MORRIS & SALOM, PHILADELPHIA, PA.

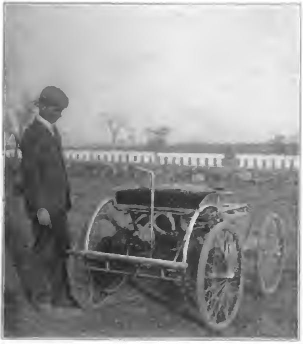
The largest of the three presents a brilliant appearance, being finished in contrasting red and black, and no machinery being visible anywhere with the exception of the steering lever. It is arranged to seat two persons, but another seat can be attached at the rear, making a total seating capacity of four.

There are two Lundell motors of nominal one and one-half horse power capacity each attached to the front axle, and pinioned on the armature shafts, gearing directly into the driving gears attached to the front wheels. The steering is accomplished by turning the hind wheels parallel with each other from a point about three inches inside of the plane of the wheel, and connected by a rod to a vertical lever of a convenient height to be operated from the front seat of the carriage. This lever is moved backward and forward in steering. Although at first sight it might be supposed that steering from the rear would be more difficult than steering from the front, yet Morris & Salom state that the carriage can be moved with the slightest effort on the part of the driver and with the greatest certainty in any direction desired, and can be turned completely around in a circle of twenty feet in diameter.

The wheels are of wood and of the usual construction, except that they are fitted with pneumatic tires and ball bearings. The driving or front wheels are forty inches in diameter and the rear or steering wheels twenty-eight inches in diameter. The batteries, furnished by the Electric Storage Battery

Company of Philadelphia, consist of four sets of twelve cells each, having a normal capacity of fifty ampere hours per cell. They are grouped in boxes and so arranged that they can quickly be pushed into place inside the body of the carriage, connection being automatically made with the controller.

The controller is a small instrument standing in a convenient position vertically in front of the seat and is operated by means of a small hand-wheel on top. There are four speeds ahead and one backward, which are obtained by various groupings of the batteries and motors in series and parallel. The carriage has a maximum speed of twenty miles an hour on a good road or street pavement, and the capacity of the battery is sufficient to give twenty-five miles. The weight of the vehicle complete with batteries is 1,650 pounds.



"ELECTROBAT." MORRIS & SALOM, PHILADELPHIA.

The carriage work, which is much admired, was performed by the Chas. S. Caffrey Co., Camden, N. J.

The smaller electrobat, which might be styled an electric road wagon, is of an entirely different construction, being built of tubular steel throughout, and the wheels being like those of a bicycle, pneumatic-tired and ball-bearing throughout. The method of gearing and general operation of the machine is similar to that of the larger electrobat above described. This machine has a maximum speed of about twenty miles an hour and the complete weight with batteries is 1,180 pounds, making it the lightest electrical road machine ever built.

The electric buggy is exactly like the smaller electrobat above described, except in the shape of the frame.

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The steam carriage which the Chas. S. Caffrey Co., Camden, N. J., are constructing for a well known Philadelphia physician, is from their own designs, and not from the purchaser's, as may have been gathered from the caption of the cut in our last issue.

R. H. Macy & Co's Roger Carriage Starts for Chicago on its own Wheels.

At 12.15 o'clock on Friday, November 15th, the Roger motor carriage, which R. H. Macy & Co., the New York dry goods house, purchased of M. Roger last summer, started from the corner of 14th Street and 6th Avenue in the attempt to reach Chicago over the public roads in a little more than one week's time.

Frank A. Macpherson, manager of Macy's bicycle department, and J. O'Conner, engineer of the vehicle, were the only occupants.

Forty gallons of gasolene were stored in the supply tanks, an amount sufficient to last for a 200-mile journey.

After leaving the store, the vehicle proceeded up 5th Avenue to 15th Street, and then to 8th Avenue. It ran along 8th Avenue to the Boulevard, thence to 110th Street, to St. Nicholas Avenue to the Kingsbridge Road, and Broadway to Yonkers.

The carriage arrived at Yonkers at 6 o'clock Friday evening, and aroused considerable interest. It stuck in the mud between Fordham Heights and Kingsbridge, and was delayed for some time, while the engineer repaired a slight derangement in the machinery, caused by the terrible state of the roads. The carriage was stored for the night at a livery stable, and at 7.40 A. M. the old post road was taken for Albany. Poughkeepsie was reached at 5 o'clock Saturday afternoon, where it was laid up for the night. Because of the heavy state of the roads the carriage was six hours behind its schedule time at this point.

The carriage left Poughkeepsie at 9.30 A. M., November 18, and reached Albany at 3.30 in the afternoon of the 19th. It was reported at Schenectady at 12.30 P. M., November 20, where it remained until the following morning in consequence of a snow storm.

Owing to the bad condition of the roads the promoters of the expedition decided to change their route and the next morning they loaded the carriage onto a freight train and shipped it to Chicago.

Strong & Gibbons' Motor Vehicle.

Strong & Gibbons, of 181 West Madison Street, Chicago, Ill., are building a motor carriage which has seating capacity for eight persons.

The motor has many cylinders, the pistons working together on one common crank shaft. These cylinders are so arranged that when all are not needed some are allowed to rest and take up the work again as required.

An electric spark produces the explosion and one lever controls all movements of the vehicle, the weight of which is said to be about 800 pounds.

Westinghouse added to the List.

George Westinghouse, the well-known inventor of Pittsburg, Pa., is now at work upon a new form of gas engine, which, it is predicted, will show surprising results in economy and efficiency. Mr. Westinghouse believes the field open for the gas engine in the driving of dynamos alone is sufficient to call forth all his brilliant abilities in the effort to improve the present mode of construction.

Reasons from Mr. Mann.

GLADBROOK, IOWA, Nov. 21, 1895.

Editor Horseless Age :

In your first issue of the Horseless Age, you have a sketch showing plan of Mann's horseless carriage. I have received some inquiries regarding same, asking why I placed the front gear so far forward. The principal reason is this: The wheel track in most of our country roads is from one to two inches deep, and to follow that wheel track while going at the rate of ten or more miles per hour, requires a sensitive handle movement instead of gear movement. For well traveled roads I pivot the wheel at the hub, but this arrangement will not do for a large portion of the country roads, here in the west. In my guiding arrangement, a lock prevents the handle from being moved seriously by deep ruts and obstacles, but is disengaged for sharp curves.

Again, to follow bad roads with ease, it is necessary to have the guide wheels within easy reach of the eye of the operator, so that in noticing the path of the wheel he may at the same time see the road some distance in front of the wheel.

To get the best results, horseless carriages must be built with reference to the roads over which they are to travel.

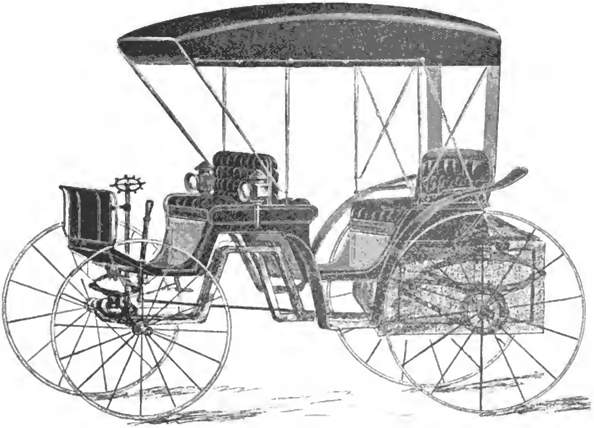
In my article in your November issue, I should have stated that the cone gears used will not give satisfaction if an ordinary belt is used. The belt must be made expressly for the purpose. I have adopted this method on account of its simplicity, and no liability of getting out of order.

Yours truly, L. C. MANN.

The Macleod Motor Vehicles.

The Alliance Carriage Co., Cincinnati, O., are preparing to apply motors to all descriptions of vehicles at present drawn by horses. As the initial move in this direction they have built for the Chicago Road Race a six-passenger vehicle, described as follows:

The motor, which is capable of 4-horse power, employs kerosene as fuel and is of the automatic type, no flame being required after four or five minutes. It is enclosed in a box at the rear of the vehicle to protect it from the dust which arises even on good roads, and from the interference of thoughtless persons, who might wish to tamper with it. The consumption of fuel is about half a gallon of kerosene per hour, while a speed of fifteen miles an hour is maintained and six passengers are carried.



MACLEOD MOTOR CARRIAGE. ALLIANCE CARRIAGE CO., CINCINNATI, O.

Vibration is avoided by securing the motor and the entire gear-work, including brake, steering apparatus, and starting and speed-regulating gear, to a strong, angle-steel framework, which also gives the additional strength required for our rough roads.

The steering apparatus consists of a fifth wheel and toothed wheel segment, acted upon by a pinion wheel which is secured on the vertical shaft or spindle, at the head of which is the guide hand wheel.

The side handle shown in the illustration is the regulating lever. With this one lever all the necessary movements of the vehicle can be effected, including stopping, starting, any forward speed from one-third of a mile an hour up to twenty or twenty-five miles an hour, and any reverse speed from zero up to six miles an hour.

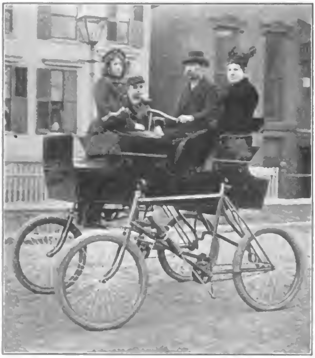
The brake, which is actuated by the foot, acts on the wheels through levers in the usual manner.

The inventor of this motor and method of applying power is Walter Macleod, an English mechanical engineer, who has made a special study of oil engines for a number of years.

The A. C. Ames Motor Cycle.

A. C. Ames, of Chicago, has been hard at work since the 2nd day of October, in the endeavor to complete his motor cycle, as he terms it.

In this vehicle, which shows some marked differences from others already illustrated, power is furnished by two steam engines of the oscillating variety. These engines are mounted on the lower bar of the bicycle frame and are coupled to the pedal shaft by means of ball-bearing crank pins. Though having the same throttle, they are independent of each other.



AMES MOTOR CYCLE. AMES MOTOR CYCLE CO., CHICAGO, ILL.

Ball-bearings are used on all bearings, and the tires are non-puncturable pneumatic. As there is no moving part in the bed of the vehicle, no vibration is experienced. The only moving parts are the pistons, one on each side, and the crank shafts and chains.

The boiler is of the Scotch type, having one 4-inch tube for a fire box, and 44 ⅝-inch brass tubes, 20 inches long, for the return. The heat passes under the shell the entire length of the boiler, traveling three times the length of the boiler, and then passes out by forced draught with the exhaust.

The feed water passes through a pressure heater inside of the boiler jacket. The fuel is gasolene, the burner being the result of many careful tests. It is really two burners in one: one, controlled by hand, to heat the generator; the other, controlled by the steam pressure or by hand as desired, for the boiler.

When the vehicle is stopped it is not necessary to touch the burner, for the steam pressure rises a few pounds and the regulating valve is closed by steam, which subdues the fire under the boiler. Then as the pressure drops a few pounds, the fire starts up again automatically.

The engines are 1¾ inch bore, 18 inch stroke. The valves are held in their seats by the steam, so that it is impossible for them to get out of order or leak. The trunions are of cast iron, working in brass rings, which also form the packing or glen for the packing around the valve.

The valve is set automatically each stroke, and is cut off at ⅝ stroke. The weight of the entire rig, with water complete for a run, is only about 400 pounds.

A company, called the Ames Motor Cycle Co., with a capital of $100,000, has been organized to manufacture the Ames motor vehicles and the Ames traction engines for farm use. They expect to be ready to fill orders about the first of the year.

The Raymond Improved Gas Engines.

We herewith illustrate a 50-horse power (actual) double cylinder Raymond improved gas and oil engine, manufactured by the J. I. Case Threshing Machine Co., Racine, Wisconsin, the chief distinctions of which are as follows:

They are built in three styles, viz: Style S, single cylinder, 1 to 20-horse power (actual). Style D, double cylinder 4 to 50-horse power (actual), and style Q, quadruple cylinder 60, 85, and 100-horse power (actual).

In the single cylinder the impulse or explosion occurs every second revolution, in the double cylinder every revolution, and in the quadruple cylinder every stroke or two to each revolution. The impulses occur in all styles of engines as above described whether running light or under full load, thus assuring steady motion under variation of load.

The Raymond improved gas and oil engine will, when belted or coupled direct to standard dynamos, produce a steady commercial electric light, and in so doing it is unnecessary to say that they will furnish an abundance of steady power for operating any other kind of stationary plant.

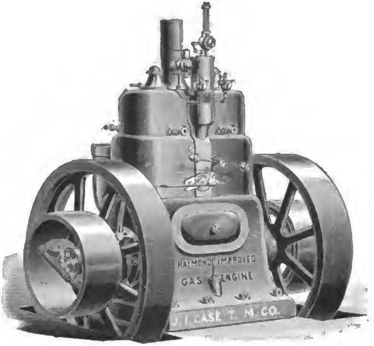
In construction, they are vertical, of symmetrical design, simple, compact, entirely self-contained, and styles S and D are enclosed in an iron casing.

The main frame or base of engine is cast in one piece, strongly ribbed, and contains the bearing for the main crank shaft, the latter being well balanced at the crank, and also provides a reservoir for oil into which the crank dips at every revolution, thus assuring perfect lubrication of the crank and all moving parts.

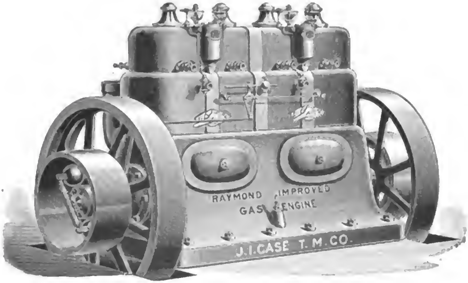
The base is furnished with a large vent pipe in the back to allow cold air to circulate inside.

The rotary valves are lubricated from sight feed oil cups on the outside of the casing, the only oil cups used in connection with the engine.

A special feature with regard to the oiling is the method of oiling the cross head pins in the pistons. This is accomplished with a pump arrangement attached to each connecting rod, which forces the oil on these bearings, keeping them cool and perfectly lubricated.



50 H. P. RAYMOND IMPROVED GAS ENGINE



100 H. P. RAYMOND IMPROVED GAS ENGINE.

The cylinders are bolted securely to the base, and to the cylinders are bolted the heads which contain the rotary valves and form the explosion chamber.

The rotary valves are one of the principal advantages offered. Being at the top of the cylinder they are held to their seats by spiral springs, are supplied with ball-bearings, and are operated by a set of spur gears direct from the crank shaft. Thus it will be seen that the very action of the valves, when working, has a tendency to keep them perfectly seated, and that they run with very little friction, and are noiseless.

The governing device is of the automatic shaft governor principle, and is supplied with ball-bearings to assure freedom of movement.

The steadiness with which the Raymond improved engine runs is due to the sensitiveness of this governing device, which regulates the exact amount of gas mixture used for each impulse. So sensitively and accurately does this governing device work that scarcely 2 per cent. difference in the speed of the engine can be discerned in throwing on or off a full load of electric lights, or any part thereof, the governor and valves regulating instantly the amount of gas mixture necessary to keep a uniform speed and perfectly steady light.

Every moving part is positive in its motion, and the speed is controlled entirely by the shaft governor, which admits the proper amount of gas mixture to maintain an exact speed whether running with full load, part load, or no load.

The patent starting device is another feature on these engines, making it possible to start a 100-horse power engine with as little effort as the 3-horse power, no pumping or crank device being used.

The ignition on all sizes of engines is accomplished entirely by electric igniters, supplied from storage or primary batteries. The electrodes are so placed in the cylinders that their positive working can be seen from the outside, and they can also be adjusted from the outside while the engine is running.

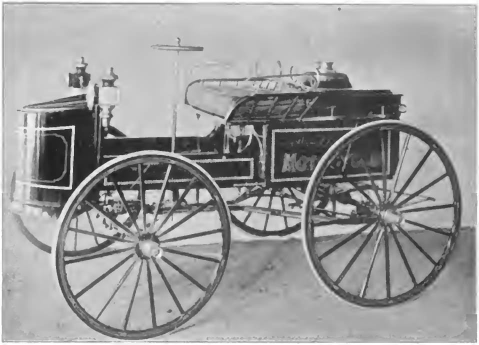
Another advantage offered by these engines, is that when connected to both gas and oil they can be changed instantly from one to the other with no perceptable variation in the speed. With the patent starter, electric igniters, automatic shaft governor, and a perfect oiling system, it being only necessary to keep oil in the base and fill the oil cup for the valve, the engine needs very little attention and requires no skilled mechanic.

The power derived from the Raymond improved gas and oil engines is said to be produced at a remarkably low cost.

Every engine is tested thoroughly, being belted to a dynamo which is connected to a bank of 16 candle power incandescent lamps, and given an actual test to develop its rated horse power, and produce a perfectly steady light before leaving the factory.

These tests have been inspected by a number of the best electricians in the country, and the engines have been pronounced by them perfect in every detail.

The J. I. Case Co., are applying this engine to wagons, but are not yet prepared to furnish details of their wagon motor.



STEAM BUGGY. JOSEPH SHAVER, MILWAUKEE, WIS.

Joseph Shaver's Steam Buggy.

We present in this issue a picture of the steam buggy of Joseph Shaver, Milwaukee, Wis., which was partially described in the November number.

The fuel used is gasolene, and the boiler is made of one solid piece of steel tested to 500 pounds hydraulic pressure. From 60 to 75 pounds of steam are required to operate the vehicle satisfactorily.

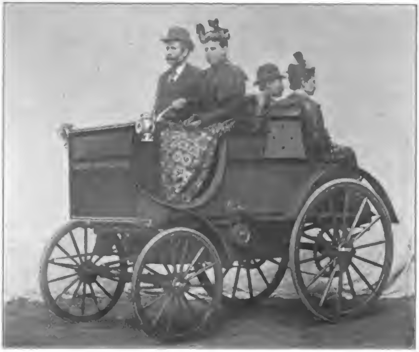
The boiler is automatic and keeps the water at a certain point, and by means of a blow-off valve it can be set at any pressure of steam desired.

The vehicle will run either backwards or forwards, and at any speed desired within reason.

Near the seat is a round wheel from which a bar runs down through the buggy, and is fastened to three small wheels below. From them runs a cable wire to each axle, so that turning the wheel turns the axle in any direction desired.

The speed can be regulated from one mile an hour to forty miles, and the buggy can be stopped at a moment's notice, as it is provided with a fine brake that works directly on the hind hub of one wheel, and brings the wheel to a dead standstill when set.

Mr. Shaver claims that he can turn a shorter corner with this buggy than any other buggy can turn, and that it will run either forwards and backwards, and as fast one way as the other. It is operated by a friction pulley going forward on a reversible clutch.



TWO-SEATED MOTOCYCLE. GEO W. LEWIS, CHICAGO, ILL.

The Lewis Motocycles.

At the risk of some repetition, we reprint a revised description of the two motor vehicles built by Geo. W. Lewis, 82 Willis Court, Chicago, and entered in the *Times-Herald* contest.

Mr. Lewis was one of the first in this country to prove the practicability of the gasolene road vehicle. He is the inventor of the Lewis gas and vapor engine, of which he has about 800 in successful operation.

In December, 1894, after several years' experiments he brought out and operated in the neighborhood of his home the one-seated vehicle illustrated on the next page, weighing about 1,250 lbs., and is propelled by an upright single cylinder Lewis' gas engine of 2-horse power. The power is transmitted equally to both hind wheels by means of an equalizing gear. The engine is placed behind the seat, likewise the battery which furnishes the electric spark for igniting the charges of the cylinder.

Mr. Lewis designed all parts of this wagon, even to the wheels which have roller bearings and solid rubber tires. He will enter this vehicle in the *Times-Herald* contest, November 28th, 1895.

The engine will make from 300 to 500 revolutions per minute at the will of the operator. A volume governor is employed so that air and gas is taken in proportion to the amount of work done, and its speed is so steady that a good electric light can be produced by this engine.

Mr. Lewis also employs a patented process of making explosive gas, which he claims produces a better quality of mixture and hence insures even and quick combustion and regular explosions.

An interesting feature of this vehicle is found in the mechanism which transmits the power from the motor. The fly wheel of the motor is also a disc from which the power is transmitted to the gear by means of a friction pulley which runs the vehicle forward or backward, and is also used as a brake.

On the bottom of the vehicle in front of the operator, is a shaft upon which the operator places his foot to control the vehicle. Pressure in one direction puts the vehicle in motion, and in the other, stops it.

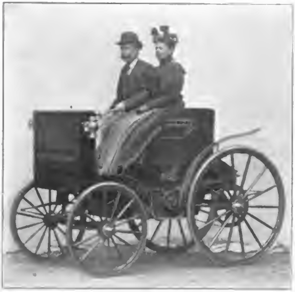
The speed and power gear is designed for pulling a heavy load or increasing speed as desired. In accomplishing this, the speed of the motor need not necessarily be changed. For example, if the occupant of the vehicle wishes to stop and talk with someone for a time, he can set the motor to a slow speed and thus economize somewhat in consumption of fuel which under ordinary conditions is about one cent per hour for each horse power.

The tank containing the gasolene holds enough for about a hundred mile run, and is located in the front near the water tank.

The gearing is of raw hide, practically doing away with the noise. Steering is accomplished by a bicycle lever in the center of the axle. Both wheels are operated by means of separate rods connected with the steering lever, and are pivoted at the hub as close in line with the felloe as possible to make the steering easy and prevent the lever from being jerked out of the hand when an obstacle is encountered.

The battery which supplies the electric spark to the cylinder is placed behind the seat, and in connection with it a very small generator is used to keep the battery in perfect working order.

Wooden wheels are used fitted with solid rubber tires of the Rubber Tire Wheel Co., and the Axles have roller bearings of Mr. Lewis' own construction. The front wheels are 32 inches in diameter, and the rear ones 44 inches.



ONE-SEATED MOTOCYCLE. GEO. W. LEWIS, CHICAGO, ILL.

From the hind axle an adjustable connecting rod is fastened to the bearing of each of the driving sprocket wheels, keeping the distance from the center of the sprocket wheels to the hind axle the same under all circumstances so that the chains will have the proper tension.

Many conveniences are provided for in this wagon. Warm water for washing the hands or face is ready at all times. To prevent this from freezing when the wagon is not in use, it is only necessary to open a valve and let it run out.

Mr. Lewis has also constructed a two-seated vehicle, which he will enter in the contest. This vehicle has the same mechanism in every detail as the single-seated vehicle, except it has a double cylinder motor of 4-horse power capacity.

The engine weighs about 450 lbs., and will develop about 6 brake horse power. This vehicle weighs about 1,500 lbs., in running order.

The gasolene and water tanks are placed in the dash board of the vehicle. This is considered the best location, as the gasolene is not exposed to any heat from the motor. The water tank is covered in front with perforated sheet iron, so that much of the vapor generated by the motor will be condensed in the tank.

The Lewis motors and motor wagons will hereafter be built much lighter, as these here illustrated have been built more especially to prove the practicability of the self-propelled road vehicle.

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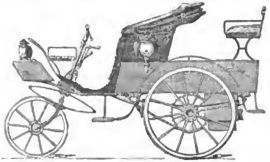
The Serpollet Steam Vehicles.

The Serpollet steam vehicles are now coming into prominence in France. The peculiarity of these vehicles is the boiler, which is of cylindrical shape and has three horizontal flattened tubes, one above the other. Looking down on a tube, it has the form of an interrogation point, the stem of the interrogation point passing out through the shell of the boiler. The tube is doubled on itself, so that the water passes through the stem and the curved portion to the end, and then back over practically the same course again to the outside of the boiler. Each tube has very heavy steel walls, and is flattened so that the interior passageway is only a thirty-second of an inch wide. The walls are so thick that they form an excellent reservoir for heat, and still greater heat storage is furnished by heavy cast-iron blocks surrounding them. The water goes first into the bottom coil, then into the middle one, and finally to the top, which communicates directly with the engine. There is no storage of water whatever in the boiler. The water is not only evaporated, but is also superheated to a temperature of 550 to 600 degrees Fahrenheit in passing through the tubes, and is forced into the boiler from a storage tank by a small pump driven from the main shaft of the engine. The supply is pumped in stroke by stroke to make the steam required by the engine, and if the feed pump stops the engine stops at once. In order to start the machine in motion the driver just before starting has only to work a small pump by hand for a few strokes and this forces water into the tubes, where steam is generated instantly, the engine is started, and the ordinary feed pump set in motion. For the sake of simplicity the feed pump has a fixed stroke, and each revolution of the shaft forces along the same quantity of water. As the power of the engine depends entirely on the amount of water delivered to the boiler tubes, some means of regulating the quantity had to be designed. The apparatus adopted consists of a three-way cock, which enables part of the water to be returned to the storage tank. The exact proportion thus returned is regulated by moving the cock, and can be adjusted with great ease by the man who steers the carriage.



SERPOLLET STEAM VEHICLE.

The steering is accomplished by moving a front wheel just as in a tricycle, the carriage running on three wheels. The vehicle is stopped by shutting off the water supply of the boiler entirely and applying a brake operated by the foot of the driver.

The total weight of the carriage, with fuel and water for a ride of eighteen miles is 2750 pounds, and it will carry six or seven passengers. The rate of speed that can be attained on the best roads is fifteen and five-tenths miles an hour, the exact rate depending on the grades and the condition of the roads.

One type of four-wheel Serpollet carriages has recently been adopted by the French War Department for hauling ammunition.

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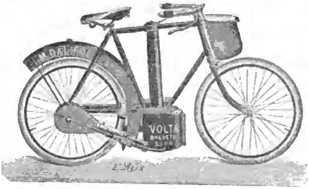
The Steam Bicycle of M. Dalifol.

The accompanying illustration represents a steam bicycle built by M. Dalifol, of Paris, last summer, and exhibited at the Rapp Gallery just before the race of last June, though not entered in the competition.

The boiler produces steam almost instantaneously. The fuel employed is gasolene, although with slight modifications coke can be used.



The water-tank curves over the wheel, and the water is supplied to the boiler at the will of the rider, by means of a suction pump.

The machine weighs about 155 lbs., and has strong pneumatic tires. It makes no smoke or odor, and is capable of 20 miles an hour.

Mr. Dalifol is building a quadricycle, of the same general plan, but showing some improved features, which will be exhibited at the Salon du Cycle in December.

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More About the Elrick Vehicle.

George Elrick, of Joliet, Ill., hopes to compete in the contest of November 28th. His machine has four wheels, and is intended to carry two persons, but by taking out four pins it becomes a motor cycle, to carry one person.

The motor with all its connections weighs only 20 lbs., and the entire weight of the machine is only 80 lbs.

The steering gear is very simple, weighing only 1½ lbs.

The cost of running the vehicle is said to be only 10 cents for each hundred miles, and the maximum speed is 25 miles an hour.

The machine, in Mr. Elrick's opinion, is admirably adapted for delivery, express, postal, and military service.

The motor can be attached to any carriage.

The Bird Motor Wagon.

Henry R. Bird, of 217 Linwood Avenue, Buffalo, N. Y., has just completed a motor wagonette, seating four dos-a-dos, and weighing about 700 lbs. The motor which is of the gasolene explosion type, is encased in a box underneath the seats, where is also placed the gasolene tank. The cylinder of the engine is cooled by water contained in a tank or receptacle, which takes the place of the ordinary dashboard.

The method of applying the power to the running gear is new, and is entirely the invention of Mr. Bird. He has had it patented. The horizontal motion of the piston-rod of the cylinder is changed to circular motion in the ordinary method of the crank attachment. From the crank a simple sprocket wheel joins the running gear.

In the application of power to the motor wagon, the speed and controlling gear is of the utmost importance, in order that the vehicle may always be under the rider's control without stopping the engine.

Mr. Bird uses for this purpose the "Holmes' variable and reversible frictional gearing," invented by Britain Holmes, of the E. & B. Holmes Machinery Co., 59 Chicago Street, Buffalo, N. Y.

By means of this gearing, the operator is said to have the wagon under more perfect control than he could have a horse, for by moving a single lever up or down the wagon is moved backward or forward, fast or slow, or stopped entirely, if desired.

The wagon is said to run noiselessly and without disagreeable vibration, and to be capable of a speed of 30 miles an hour.

The wagon complete weighs 750 pounds, and Mr. Bird is confident it will take several tons up any hill a horse can surmount with a load. He has applied for a patent on the vehicle as a whole, and on special parts of its mechanism.

A corporation is to be formed to manufacture the Bird motor wagons.

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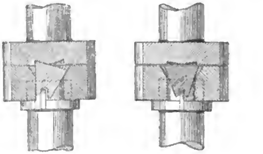
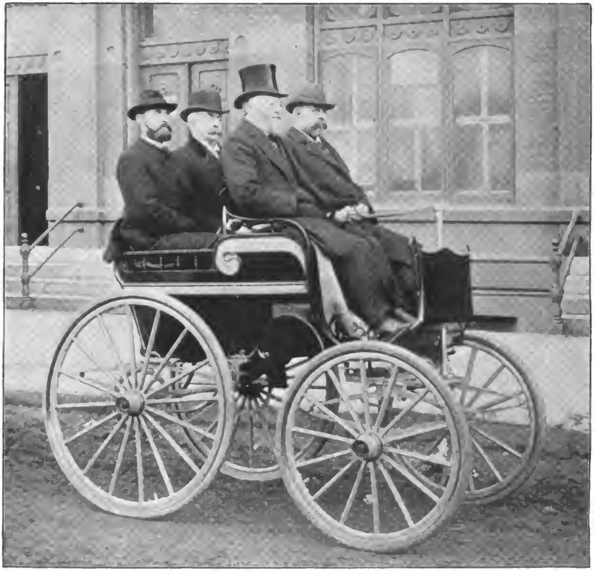
The Stewart Automatic Clutch.

R. F. Stewart, Pocantico Hills, N. Y., is the inventor of an automatic clutch, which he believes will be found of great value by inventors and builders of motor wagons. It is designed to regulate the drive-wheels in turning corners. By attaching one clutch to the hub of each drive-wheel the wheels turn independently of each other. The clutch can also be used on the driving shaft, accomplishing the same purpose, and allowing the use of much smaller clutches.





MOTOR TRAP. HARTLEY POWER SUPPLY CO., CHICAGO, ILL.

The Hartley Steam Vehicles.

The stylish trap, which is entered by the Hartley Power Supply Co., Monadnock Building, Chicago, weighs 750 lbs., all told, and is propelled by the Hartley steam engine, a combination of the rotary and automatic cut-off principles, fully described in the November number of The Horseless Age.

The seats of the vehicle are so constructed that they can be arranged dos-a-dos, or in the ordinary manner, by changing the rear seat. Pneumatic tires and ball-bearings are used, and each wheel runs independently of the others.

The motor which gives as high as 5-horse power, is capable of 1,500 revolutions a minute, and is easily controlled by a throttle valve. No gearing whatever is required, and no flywheels. Reserve power is always at command for rough places or hills either by the use of the throttle or the governor, as desired. A sudden stop can be made by reversing the engine or applying the brakes, which are very strong and instantaneous in their action.

Steering is managed by a lever running to the fifth wheel, pivoted from the center, and locking automatically in any position. The vehicle can be turned within its own length.

The wheels, which are of substantial construction, are 44 and 36 inches in diameter, respectively.

The fuel employed is gasolene, wood or coal, a small grate being carried along to be substituted for the oil burner should it be impossible to obtain oil.

The Hartley Power Supply Co., will manufacture all kinds of motor vehicles, including delivery wagons, tricycles, bicycles, and heavy trucks. Their vehicle motors, which will range in power from half-horse up to 10 or 12-horse will also be sold separately to the carriage and wagon building trade.

The half-horse motors will weigh about 75 lbs., complete, fuel included.

The engine which they are now applying to a heavy truck for the Englewood Express Co., is geared up 10 to 1, making an actual pull of 10-horse power. On light rigs the geer will be 5 to 1, and on bicycles and tricycles the application of power will be direct.

Lightest Motor Carriage in the world.

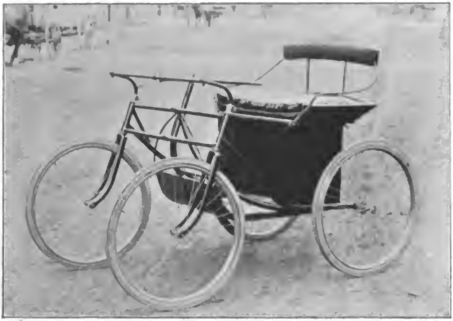
M. H Daley, Charles City, Iowa, manufacturer of the disc and lever harrows, has just completed a vehicle which he calls a motor carriage, and believes to be the lightest four-wheeled self-propelled vehicle in the world. Including the clutch to attach the motor it weighs only 95 lbs , and with the motor on the total weight is 195 lbs.

Mr. Daley has been studying to get an even stroke every revolution, and is confident he has succeeded. This he does by regulating the stroke of the piston in proportion to the power required, and, at the same time, lessening the space behind the piston to get the proper compression, and diminishing the quantity of oil pumped into the carburetor.

As there are two cylinders, one explodes while the other is compressing, giving an explosion every revolution, whether little or much power is used.

The amount of gasolene consumed is about one gallon per 100 miles. Anyone can operate the vehicle, which is so low that a child can step into it from the ground.

Mr. Daley is organizing a company with a capital of $100,000 to manufacture this and other sizes of motor vehicles. He has a well appointed factory, which he can utilize for the purpose, and expects to be able to sell the vehicle here illustrated for $500.



LIGHTEST MOTOR CARRIAGE IN THE WORLD. M. H. DALEY, CHARLES CITY, IOWA.

In going over uneven ground the forward wheels rise or fall a distance of ten or twelve inches, if necessary, and thus relieve the body of the vehicle of all extra strain.

The steering device is quite novel. The wheel on the inside of the curve turns faster than the one on the outside; the difference in the speed of the wheels being in such relation as always to keep each wheel at right angles with its hub to the center of the circle which is being described, or to that point where lines drawn through the center of each hub would cross. This construction, which prevents all side strain on the wheels, cannot be seen in the accompanying illustration.

For some time Mr. Daley experimented with a rotary gasolene motor, but finally abandoned it, and is now using a double-cylinder gasolene motor differing little from others, except in the method of governing the speed.

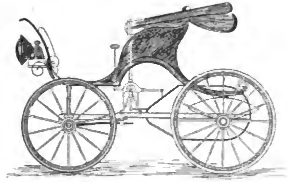
In order to give the best results, a gosolene motor must use a proper proportion of oil and air. In the regulation of speed the prevailing method has been to shut off the oil and air, and allow the engine to run several strokes before renewing the supply. This, it is claimed, gives an unsteady motion.

The Maginn Power Generator Co.

This is the title of a company organized to develop a motor vehicle patent, and having offices in the Masonic Temple, Chicago.

In their machine the products of the explosion, and not the explosion itself, are said to be the operating principle.

The engines, which are oscillating, have double cylinders, set-quartering to avoid dead centres. They are reversible, and are geared by chained sprocket-wheels to the axle of the carriage. The rear axle revolves with the wheels and the power is applied direct to this axle. The steering apparatus is connected with the front axle, the wheels of which are loose upon the axle. The operator of the vehicle has but two levers to handle, and with them accomplishes all the movements of starting, stopping, reversing, backing up, steering and controlling the carriage. Within the body of the vehicle, to be operated by the foot, is a slow-starting and hill-climbing device. The entire mechanism of this 4-horse power generator

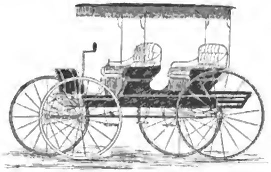


and engine complete occupies a space of 18 inches square, and is inclosed within a covering. The same covering also incloses the transmission gears, and protects all the working parts from weather, mud and dust.

* * *

The A. J. Pierce Motor Carriage.

The Pierce Engine Co., Racine, Wis., manufacturers of the Pierce gas engines, have constructed a very substantial looking vehicle, which is propelled by one of their engines. The vehicle weighs about 1,600 lbs., and may be described as a surry top placed on a common running gear, with the box extended backwards to make room for a water tank.



MOTOR CARRIAGE. PIERCE ENGINE CO., RACINE, WIS.

The motor is placed under the vehicle, and is boxed in to protect it from dust, etc. It has two cylinders, each capable of 3-horse power. The gasolene tank is located under the seat.

No governor is used on the engine, as the speed is controlled by the operator from the front seat. Any speed from two to sixteen miles an hour can be obtained.

On the right hand side of the seat is a lever which is used to start, back up and stop. Another lever in the bottom of the wagon, operated by the foot, is used to throw in a gear for climbing hills.

The steering gear is a worm and gear, geared up for rapid motion, and is very sure and easy to operate.

The vehicle is driven by chains connected from a differential gearing to the rear wheels.

The American Motor League.

On Friday evening November 1st, a meeting was held in the rooms of the School of Electricity, No. 385 Dearborn Street, Chicago, for the purpose of forming under the above name, an organization for the general advancement of the new fledged motor interest of America. The meeting was the result of a suggestion made by Charles B. King, of Detroit, Mich., in a letter published in the last issue of the Horseless Age.

At the appointed hour the meeting was called to order. Dr. J. Allen Hornsby, having been elected chairman by acclamation, made an introductory speech, outlining the purpose of the call which had been issued, and then invited a number of those present to state their views in regard to the general policy of the organization contemplated. Some favored a broad and liberal platform upon which all concerned with motor vehicles, users included, could stand, while others thought the membership should be limited to manufacturers of motor vehicles, and specialists making a study of the scientific problems connected therewith.

Messrs. Chas. E. Duryea, Charles B. King, H. D. Emerson, Elwood Haynes, Henry G. Morris, Sterling Elliott, W. G. Walton, and others spoke on this subject, and such diverse views were brought to light that it was finally deemed best to appoint a committee on organization, which should report at the next meeting of the League, to be held in Chicago about Thanksgiving time. Dr. Hornsby was elected temporary president, and F. U. Adams, of the *Times-Herald*, temporary secretary. The chair appointed Charles E. Duryea, and H. D. Emerson to act with himself on the committee of organization.

The following is a list of those present:—H. D. Emerson, Cincinnati; Henry G. Morris, and Pedro G. Salom, Philadelphia; Sterling Elliott, and C. A. Clarke, Boston; George Henry Hewitt, H. W. Leete, Charles E. and J. Frank Duryea, Springfield, Mass.; W. F. Barnes, and C. M. Giddings, Rockford, Ill.; Elwood Haynes, Kokomo, Ind.; George Richmond, J. Wallace Grant, and E. P. Ingersoll, New York; Charles B. King, Detroit; W. G. Walton, Hamilton, Canada; J. A. Chase, Pasadena, Cal.; A. Taylor, and Edward E. Goff, Chicago; C. F. Karns, Salt Lake City, and Dr. J. Allen Hornsby, chairman.

Before the meeting adjourned, resolutions were passed commending the *Times-Herald* for its enterprise in organizing the motor vehicle contest.

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The Lesson of a Runaway.

Carlos C. Booth, M. D., of Youngstown, O., had a terrible runaway last June, in which his wife came near losing her life and the horse was killed. Reading of the Paris Race about this time he at once made a design for a motor carriage, which he is now having constructed.

It is not a racer, but is designed for physicians and everyday business use. He hardly expects to complete it in time to exhibit it at Chicago.

◆

Canada to have a Motor Vehicle Race.

The Canadian Engineer, published at Toronto, Can., proposes that an exhibition of motor vehicles be held in Toronto next summer. The proposition is also advanced that a motor vehicle race be held at Hamilton next season, under the auspices of the Hamilton Jockey Club. The Massey-Harris Co., the big agricultural implement manufacturers of the Dominion are taking a lively interest in the subject, and from present indications our Canadian friends will be introduced to a new sport before '96 has grown old.

The Gawley Motor Carriage.

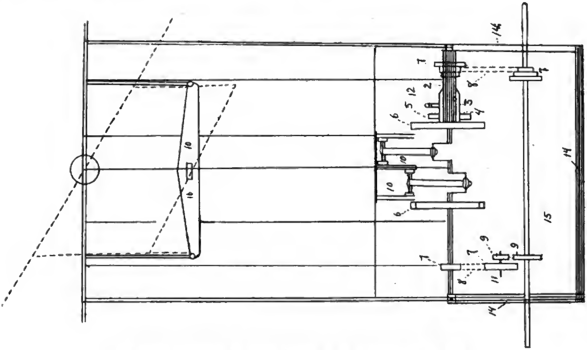
T. R. Gawley, of Aurora, Neb., writes that he is putting the finishing touches on his carriage, and expects to have it in Chicago before Thanksgiving Day The vehicle he has designed is specially adapted to Western roads.

The motor is a double-cylinder gasolene motor, developing six horse power.

In the diagram, No. 1 is the main shaft of the motor.

No. 2 is a hollow shaft working on the outside of No. 1, with sprocket wheels attached to it.

No. 3 is another hollow shaft working on the outside of No. 2, and on which the friction clutch is fastened.



MECHANICAL DIAGRAM OF MOTOR WAGON. T. R. GAWLEY, AURORA, NEB.

No. 5 is the rim of the fly wheel.

No. 6 is the fly wheel.

No. 7 is the sprocket wheels.

No. 8 is the sprocket chain.

No. 9 are friction wheels used for back-up gear.

No. 10 is the motor, a twin gasolene motor, working on opposite centres.

No. 11 is a little shaft on which the little friction wheel of the back-up gear works.

No. 12 is a casting to be used for the purpose of throwing the machinery in and out of gear.

No. 14—Springs.

No. 15—Space to be used for carrying gasolene and water.

No. 16 is the steering apparatus which rests on all round bearings, preventing any binding from vibration.

The back axle and the carriage bed are made the same distance apart by means of a reach-rod, which extends from the spring block to the corner of the bed on both sides.

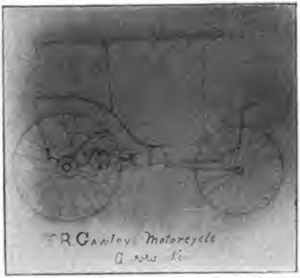
The wheels are of wood and are provided with rubber tires. The front wheels have ball-bearings in the hubs, and are 36 inches in diameter. The back wheels, 42 inches in diameter, are held stiff on the axle by means of ratchets. To enable one wheel to slip back in turning a corner, the hind part is set on roller bearings under the spring blocks.

The carriage is steered from the back seat by means of a lever or teller. It has a seating capacity of from four to six persons, and is said by the inventor to have power enough in reserve to take it anywhere.

The weight of the vehicle is about 900 pounds.

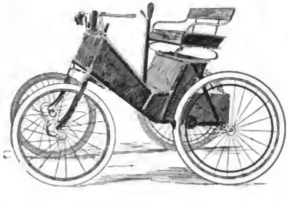
Mr. Gawley wishes to find a capitalist to take hold of his invention. He guarantees to sell fifty machines in his own state of Nebraska, just as soon as they can be put on the market.

"PYRO-PNEUMATIC" WAGON. P. E. MCDONNELL AND W. A. BRENNAN, CHICAGO, ILL.



Max Hertel's Motor Cycle.

The motor vehicle of Max Hertel, Chicago, Ill., is modelled in general outline after the motor bicycles brought out recently in France and Germany. It has four wheels and a seating capacity for two. Power is furnished by a double cylinder gasolene motor.



The wheels run on ball bearings and are fitted with pneumatic tires. The steering is accomplished by means of a simple handle bar, and the vehicle can be turned within a circle of ten feet.

The total weight, including fuel and water, is 220 pounds.

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Fred. Kuebler, superintendent of the Daimler Motor Co., Steinway, L. I., left recently for Europe to visit the various continental centres where the motor vehicle question can be advantageously studied. Mr. Kuebler took with him a good supply of THE HORSELESS AGE, Vol. I, No. 1, with which to astonish the European trade.

Thanksgiving Day Route.

Synopsis of the Course and Revised Rules.

On page 31 will be found a map of the revised course which the engineers appointed by the *Times-Herald* have laid out for the Thanksgiving Day contest. As the day is a holiday, the competing vehicles will have a clearer course than would have been possible on an ordinary workday, and are expected to make better time in consequence.

The vehicles will be started at Midway Plaisance and Jackson Park, and will proceed west on the Midway through Washington Park and Fifty-fifth Street Boulevard to Michigan Boulevard, where they will turn north on this broad thoroughfare and sweep past the lake front, the auditorium, the public library, and across the Rush Street bridge.

On the north side the route continues up Rush Street, east on Chicago Avenue, and north along the beautiful Lake Shore drive through Lincoln Park, and by way of the Sheridan Road to Evanston. The return route is by way of North Clark Street, Ashland, Belmont and Milwaukee Avenues to the west park boulevard system, and east on Fifty-fifth Street Boulevard, through Washington Park, and the Midway to the starting point.

The route includes about fifty-five miles of roadway, and contains sections of all grades of pavement and roadway. Nothing but a severe snowstorm can render the route unfit for the test.

The preliminary tests were held at 1557 Wabash Avenue, and L. L. Summers and John Lundie, the committee on tests began their work on Tuesday, Nov. 19. The Studebaker Brothers' Manufacturing Company kindly place this large building at the disposal of General Merrit and other judges, and arrangements have been perfected by which the various motocycles can be placed on exhibition in this room up to December 4.

RULES FOR THE RACE.

The judges have carefully revised the official rules, which are as follows:

ART. 1. The contest or race will be international in character, and any vehicle complying with the conditions may compete.

The vehicles shall have three or more running wheels, and shall derive their motive power from within themselves. No vehicle will be admitted to the competition which depends in any way upon muscular exertion except for the purpose of guidance.

ART. 2. The vehicles shall be capable of carrying at least two persons, one of whom shall be an umpire selected by the judges, the other or others may be the representatives of the owner of the vehicle. An umpire must accompany each vehicle over the route.

ART. 3. The route will be as follows: Starting at the jun
tion of Midway Plaisance and Jackson Park, west on Midw
Plaisance, through Washington Park past the floral tri
and refectory, west on Fifty-fifth, north on Michigan
vard, over Rush Street bridge, north on Rush St
on Chicago Avenue, north on the Lake Shore dri
Lincoln Park and the Sheridan Road to Cornelia
on Cornelia, north on Pine Grove, east on Gra
on the Sheridan Road, west on Lawrence A
Kenmore Avenue, west on Rosemount Ave
Sheridan Road to the city limits of Eva
west on Lincoln Avenue, north on For
Davis Street, south on Chicago Avenu

Street (Chicago), west on Lawrence Avenue, south on Ashland Avenue, west on Roscoe Street, south on Western Avenue, west on Belmont Avenue, south-east on Milwaukee Avenue, south on Humboldt Boulevard, through Humboldt, Garfield, and Douglas Parks, south on California Avenue, east on Twenty-sixth Street, south on Western Avenue, east on Thirty-fourth Street, south on Western Boulevard, east on Fifty-fifth Street Boulevard, through Washington Park and the Midway, and finishing at the starting point. Relay stations are established at the following points: The corner of Grace Street and the Sheridan Road, North Clark Street and Devon Avenue, California Avenue and Twenty-sixth Street.

ART. 4. There will be stationed at each relay point a time-keeper, who will report the time of arrival and departure, but stoppage at relay stations will be optional with contestants, and no allowance will be made for delays in replenishing.

ART. 5. It is expected that each contestant will make his own arrangements for replenishing motive power, or taking advantage of the relay facilities.

The umpires will be furnished with a correct statement of supplies furnished at the starting point, at each relay point, and where possible of the amounts remaining after completion of course.

ART. 6. Vehicles will assemble at the junction of the Midway Plaisance and Jackson Park at 8.30 a. m., Nov. 28, 1895, and take such positions as may be assigned them by the judges.

ART. 7. Each vehicle entered shall carry a card conspicuously displayed, this consisting of a white card 12 inches square provided with a black letter 6 inches long. Each contestant shall be designated by number. The numbers and order of starting shall be designated by the judges.

ART. 8. Contestants may change conductors at such points as they may desire. The umpire appointed by the judges will remain with the vehicle until it finishes the contest, either by completion of the course or by withdrawal.

ART. 9. Each vehicle shall be provided with a trumpet, fog-horn or other signal capable of sounding a warning signal of approach.

ART. 10. When two vehicles going at different rates of speed find themselves into proximity, the slower one must keep to the right and leave half of the road available. Any vehicle attempting to prevent by maneuver the passage of any other vehicle will be disqualified. The umpire on the vehicle will be expected to enforce this condition.

ART. 11. The ordinary rules of the road must be observed by all vehicles, and in meeting ordinary vehicles it is expected that care will be exercised to insure proper safety to the ordinary transients.

ART. 12. Any civil or penal responsibilities must rest entirely with the contestants who incur them. The judges, umpires or referees assume no responsibility of any nature whatsoever.

ART. 13. If several vehicles arrive together or successively
ront of an obstacle which necessitates the stoppage of the
ehicle, the other vehicles must stop in their order with-
empting to pass each other till a distance beyond the
of one hundred yards has been covered.

The umpire of the first vehicle to reach the
l have the ruling power.

he umpire of each vehicle will take the time of
struction and the time of its removal. This
rted to the judges.

ase may two vehicles move along abreast
ial of speed. A vehicle wishing to main-
do so before proximity necessitates the
y as per article 12.

ART. 17. No vehicle will be admitted to the competition unless the safety of occupants, spectators, and users of the public highway will be insured.

ART. 18. The judges reserve the right at their discretion to debar any vehicle which may contain elements either of danger or from its construction an evidence of weakness or general impracticability.

ART. 19. For the purpose of eliminating from the competition any impractical or unsafe vehicle, and for the further purpose of securing exact and authoritative data on which to base decisions and make awards, all contesting motocycles must be submitted for preliminary tests to be held at 1557 Wabash Avenue, under the supervision of the judges. These tests will be held on Nov. 19, 20, 21, 22, 23, and 25, and the committee on tests will notify each contestant of the data on which he shall appear for the preliminary test.

ART. 20. The judges will base their awards on the showings made in the preliminary tests and in the road contest of Nov. 28. In making their awards the judges will consider and weigh the general utility and adaptability, ease of control, speed, economy of operation, cost, general appearance and excellence of design of each contesting motocycle.

ART. 21. Any vehicle which shall compete in the contest shall be placed at the disposal of the judges for tests subsequent to the road race of Nov. 28, should the judges so desire.

ART. 22. The time limit is fixed at seven hours, corrected time. Any vehicle failing to complete the official course in seven hours will be disqualified, and no prize will be awarded to it. In computing the corrected time from the time of starting and of finishing, the reports of umpires will be taken as to legitimate delays experienced upon the route.

ART. 23. Unavoidable obstacles, such as railroad trains at road crossings and other unusual obstructions in the roads, will constitute the only grounds for an allowance of time by the judges.

ART. 24. Delays experienced from imperfection of mechanism, break-downs, difficulties in starting, or similar causes, will not constitute grounds for time allowances.

ART. 25. Any repairs which may be required along the road must be executed by the occupants of the vehicle. Outside assistance will not be allowed, the umpires excepted.

ART. 26. Every effort has been made by the judges to define the route, and direction posts have been placed to aid the conductors of vehicles. The conductor of the vehicle will be responsible for not following the route, and no claims will be allowed on account of delays or inconveniences experienced on account of mistaking the route. Conductors will be expected to familiarize themselves in advance and thus avoid any trouble from these causes.

ART. 27. Any infraction of these rules may disqualify a vehicle at the option of the judges. The judges also reserve the right to modify or amend these rules.

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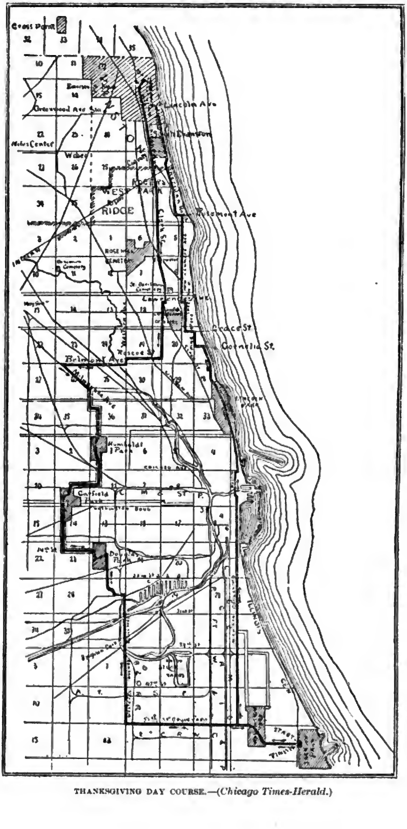
LENGTH OF COURSE AND NATURE OF ROADS.

Lieutenant Samuel Rodman made a careful measurement of the course, and found it to be 54.31 miles in length. On the nature of the roads he made the following report:

"From the starting point, along the Midway, through Washington Park, and along Michigan Avenue to Congress Street, the route is a level boulevard. Then one block of asphalt, then one block of brick pavement, then eight blocks of stone pavement to Rush Street Bridge; thence wooden block pavement along Rush Street and Chicago Avenue to the Lake Shore Drive. The four blocks north of Rush Street Bridge are in very bad condition; the remainder is somewhat rough, except on Chicago Avenue, which is smooth.



THANKSGIVING DAY COURSE.—(*Chicago Times-Herald.*)

Thence the route is a comparatively level boulevard along Lake Shore Drive, through Lincoln Park, Cornelia Street, Pine Grove Avenue, Grace Street, Sheridan Road, Lawrence Avenue and Kenmore Avenue to Rosemont Avenue. Thence along Rosemont Avenue the road is heavy sand for two blocks; thence along Sheridan Road it is sandy for about a mile, and then sandy gravel to Lincoln Avenue, Evanston. Lincoln Avenue and Forest Avenue are good boulevard roads, except about five blocks on Forest Avenue south of Davis Street, Evanston, and Davis Street to Chicago Avenue, Evanston, which are soft and heavy traveling in wet weather. From Davis Street and Chicago Avenue, Evanston, south along Chicago Avenue to Devon Avenue, a distance of three and one-half miles, the route is good, smooth wooden block pavement.

Thence south along North Clark Street to Lawrence Avenue the route is rough and extremely muddy in wet weather. Thence along Lawrence Avenue and Ashland Avenue to Montrose Boulevard, good, hard macadam; thence along Ashland Avenue, Roscoe Street, Western Avenue, Belmont Avenue, Milwaukee Avenue and Humboldt Boulevard to Kedzie Avenue, good, smooth wooden block pavement. Thence to Colorado Avenue, Humboldt and Douglas Boulevards are good, hard macadam. Thence Douglas Boulevard is asphalt to the west end of Douglas Park. Thence through Douglas Park to Ogden and California Avenues the route is macadam. Thence along California Avenue the route is good block pavement to Twenty-fourth Street, and then Boulevard to California Avenue and Twenty-sixth Street. Thence Twenty-sixth Street and Western Avenue is good block pavement to the near vicinity of the drainage canal. From the latter point and across the Western Avenue Bridge the road is very bad. The soil being clay it becomes almost impassable in wet weather, and in its present condition is the one blot in the boulevard system. Across the bridge at Thirty-fourth Street the route is taken up along Western Avenue Boulevard, Garfield Boulevard, through Washington Park and along the Midway to the starting point at Jackson Park, a good, hard macadam route."

TRACKS ALONG THE ROUTE.

"Following the motocycle route I note the feature of street car tracks, taken in order, which are found along the route. These are as follows:

On Michigan avenue, from Adams to Randolph street.

On Chicago avenue, Evanston and North Clark street, Chicago, from Dempster street to Lawrence avenue.

On Ashland avenue, from Graceland avenue to Roscoe street.

On Roscoe street, from North Robey street to Western avenue.

On Belmont avenue, from Western avenue to Milwaukee avenue.

On Milwaukee avenue, from Belmont avenue to Humboldt boulevard.

On Twenty-sixth street, from California avenue to Western avenue.

Taken in order from the starting point, the railroad crossings are as follows:

Michigan avenue at Fortieth street.
Michigan avenue at Fifteenth street.
Rush street, just north of Rush street bridge.
Rosemont avenue, one block west of Kenmore avenue.
Sheridan road, one block north of Rosemont avenue.
Chicago avenue, south of Calvary Cemetery.
Belmont avenue at Kedzie avenue.
Humboldt boulevard, two blocks north of Humboldt Park.
Douglas boulevard, two blocks south of Polk street.
California avenue at West Nineteenth street.
Twenty-sixth street, near Western avenue.
Western avenue boulevard, near Thirty-sixth street.
Western avenue boulevard, near Thirty-ninth street.
Western avenue boulevard, near Forty-ninth street.
Garfield boulevard, one-quarter mile east of Western avenue boulevard.
Garfield boulevard at Desplaines street.
Garfield boulevard at Stewart avenue.
Garfield boulevard, near LaSalle street.

The entire route is generally level. There are few points where grades of any sharpness are experienced, and these are at the bridge over the Chicago, Milwaukee and St. Paul Railroad tracks on Humboldt boulevard, and at the Western avenue bridge, south of the drainage canal. There is a slight rise at the Rush street bridge and at the head of Lincoln Park.

The route is admirably adapted for speeding. The turns are not sharp, the roads are wide, and of the entire distance only about five miles will afford difficulty even in wet weather."

THE PRIZE MEDAL.

Between Heats.

—o—

The Overman Wheel Co., Chicopee Falls, Mass., now have in course of construction a light motor vehicle of the bicycle variety, and will enter largely into the manufacture of them as soon as the experimental work is done. The vehicle, which will be ready to test about December 1st, has four wheels, is propelled by a gasolene motor, and is built low to make it easy of access and lessen the danger of accident. Three two-horse power motors will be employed.

—o—

L. B. Packard, wheel and carriage manufacturer, of Salem, Mass., is about to place a light motor carriage on the market, and wishes to correspond with makers of two-horse power motors suited to his purpose.

—o—

G. A. Kennedy, bicycle repairer and locksmith, Blissfield, Mich., is engaged upon a motor vehicle, which he will not complete before April next.

—o—

The New London Specialty Co., New London, O., are making a new model for a motor cycle, which they think is a great improvement over that mentioned in our last issue.

—o—

Among the inventors who cannot be ready for the event of November 28th is Geo. W. Robertson, Mt. Vernon, Ind.

—o—

The Buckeye Manufacturing Co., Anderson, Ind., write that they will not be ready to enter the competition of November 28, but they expect to have their motor carriage in constant use inside of thirty days.

—o—

A. W. McArthur, Rockford, Ill., will not have his vehicle completed for the competition of November 28th.

—o—

The Roger American Mechanical Carriage Co., New York, recently received one of the latest improved Roger carriages from Paris, which they have been running about the city nearly every day to the delectation of the ubiquitous small boy, and the education of those of larger growth. During one of its outings, the carriage easily surmounted a 15% grade with two occupants, one of whom was the editor of the Horseless Age. The company expect soon to receive a vehicle carrying an 8-horse motor, and provided with a reversing mechanism.

—o—

The La Porte Carriage Co , La Porte, Ind., state that they are endeavoring to have one of their Duryea motor wagons finished for them in time for the Thanksgiving Day competition, but regard it as very doubtful whether they will get it.

During the last ninety days they have had fully one hundred inquiries for motor wagons.

—o—

The Sintz Gas Engine Co., of Grand Rapids, Mich., write that the extended time is still too short for them to make an appearance at Chicago on November 28th. They are hard at work upon their vehicle, but are unwilling to exhibit their machine before it has been thoroughly tested and approved.

—o—

The Pierce-Crouch Engine Co., New Brighton, Pa., were unable to complete their vehicle in time for the Thanksgiving Day competition, but they will soon have something for publication.

L. S. Nichols, West Concord, Minn., inventor of the vehicles which the Owatonna Manufacturing Co., Owatonna, Minn., are about to put upon the market, writes that they will not be on hand Thanksgiving Day. They wish to produce a vehicle that will be perfectly practical in all respects, and find that it takes more time than they anticipated. They will employ a rotary gasolene engine if on further tests it proves satisfactory.

—o—

Haynes & Apperson, Kokomo, Ind., will have two carriages at Chicago, on Thanksgiving Day, the one represented in the last issue of The Horseless Age, and one of later and improved construction.

—o—

Reuben H. Plass, Brooklyn, N. Y., is building one of his "duplex air-gas reciprocating motors" for a surry, and expects to have it in operation in three or four weeks.

—o—

The J. I. Case Threshing Machine Co., Racine, Wis., have just issued an elegant catalogue, illustrating and describing their new Raymond improved gas engines.

—o—

The Duryea Motor Wagon Co., Springfield, Mass., have doubts of their ability to complete their new wagons in season for the event of November 28th.

—o—

John A. Barrett and Frank Perret, the two New York electrical engineers spoken of in the last issue as working jointly on an electric system of propelling and controlling vehicles, are going to the bottom of the subject. They have not commenced their shop work yet but are taking up every difficulty and solving it as they proceed.

—o—

The Riotte & Hadden Mfg. Co., 462 East 136th Street, New York, have not yet completed the kerosene motor carriage referred to in the last issue.

—o—

Samuel Lawson, of Welch & Lawson, 205 Centre Street, New York, is at work upon a steering device for motor wagons, which is radically different from anything now seen. It gives remarkable leverage, and positive in its action.

—o—

S. F. Alberger, Orchard Park, N. Y., is building a motor vehicle to be propelled by a gasolene motor, but the motor is not quite in running shape yet.

—o—

A carriage to be operated by an acetylene motor is now in course of construction at Philadelphia. As soon as the vehicle has been tested the full details will be laid before the readers of The Horseless Age.

—o—

E. V. Machette, Secretary of the Ernst Power Vehicle Co., 17 Broadway, New York, states that Victor Ernst, one of the inventors of the company, has completed the working drawings for his steam motor, and regards it as beyond doubt the greatest success of his life. Mr. Ernst is convinced that he has evolved an entirely new principle in steam engineering, which will enable him to furnish an engine more simple, economical and cheaper in construction than any ever before produced. He has also finished the conception of his generator, and is engaged on the drawings for it. The Ernst Co., expect to have a perfectly practical motor carriage ready for exhibition in the early spring.

—o—

Over 1,000 motor wagons are now in use in and around Paris.

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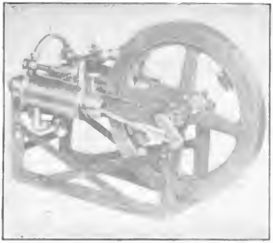

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THE HORSELESS AGE.

A MONTHLY JOURNAL

DEVOTED TO MOTOR VEHICLE INTERESTS.

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A Word to the Word Coiners.

Evolution of the Motor Idea.

WORD coiners in England and America have been racking their brains to find a name for the motor vehicle. Classic dictionaries have been searched and strange compounds triumphantly unearthed, and offered to the public as jewels of speech that should be eagerly seized and added to our store. In England we have such heathenish abominations as "autocar," "automotor," and "petrocar," while in America "motocycle" and "autocycle" have been set up to compete for popularity with terms already in vogue, such as "horseless carriage," "motor wagon," etc. These hasty inventions have been adopted by many editors and have attained considerable currency, but on analysis they are all found to be objectionable for one reason or another.

Making the fullest allowance for difference in usage between England and the United States, it seems incomprehensible that the word car can have the same meaning there as the word vehicle does here, and the prefix "auto" is not a synonym of motor, for it conveys the idea that the vehicle runs without human aid. Motor car would be properly employed with reference to some imposing vehicle used for processional or similar purposes, but as a general term for the new vehicle it is a misnomer. The other two verbal candidates for favor in England are still more inadequate. "Petrocar" might, from its etymological root, mean a car made of stone or used for hauling stone, or if the first element of the compound be associated with petroleum, which was undoubtedly the idea present in the inventor's mind, the term is seen to be altogether too narrow, for motor vehicles are not all of the petroleum class. Automotor would seem to mean an automatic motor which requires no guidance or attention, and this term must therefore be excluded.

The American inventions are not more promising than the English. "Motocycle" is a specific and not a generic term. The word "cycle" is already in common use as an abbreviation for bicycle, hence in common parlance a motocycle is a mere euphemism for motor cycle, with little excuse for being, because the "r" in motor cycle is a connecting consonant which assimilates readily with the sounds preceding and following it, i. e., it is easily pronounced. Who would think of calling a motor coal wagon, truck or omnibus, a motocycle?

Such sorties into classical realms are not unprecedented. They have marked the introduction of other great modern improvements, but in few instances have they permanently enriched the language.

While the word-coiners are pursuing their little fads, the people are quietly settling this matter for themselves, according to the laws of language and the development of ideas in the human mind.

When the trolley car was first introduced, the word coiners thrust upon the public the term "motorneer" to designate the man who controls the motor, but the new word was not accepted. The combination was too hard to pronounce, and an easier one readily suggested itself. The propelling force was a motor, and the person who controlled it was a man, hence the easiest way for the public to describe the person who exercised this new function in transportation was to compound the two words, and call him a motorman. This law of compounds is the natural and scientific method of expressing new ideas in all the Indo-Germanic languages, for it is based upon the evolution of knowledge, which is always from the known to the unknown, from the old to the new.

Similar examples of the compounding of familiar words to express new things are found in street-car, dog-cart, rubber tire, etc. In the latter instance, judging from the present monstrosities forced upon us at the beginning of the motor movement, we might have expected that some barbarous derivative from caoutchouc would have been brought forward by enthusiasts. But such was not the case. The people simply saw a new device occupying the same position on a wheel as had been filled by the steel tire. The substance of which this new device was made was rubber, therefore a simple compound of the two familiar things was formed, and we have the modern rubber tire, or, in its later development, "pneumatic tire." No amount of invention on the part of word coiners could have prevented the adoption of these terms, because they are the most economical that can possibly be found to express the ideas.

Now, bearing these illustrations in mind, let us put ourselves for a moment in the position of the public or the casual observer of things. We see a vehicle passing in the street which bears a very close resemblance to vehicles we have seen drawn by horses. The first thing which would strike us would undoubtedly be that the vehicle was not drawn by horses, or, in other words, was horseless, and this peculiarity would afford the descriptive term or adjective which we would naturally use to qualify it, and we would call it a horseless carriage, if the vehicle in general outline resembled vehicles which we had been accustomed to call by that name. If it resembled a wagon, or a buggy, we would use one or the other of these terms, with the prefix horseless.

But the novelty of seeing vehicles without horses would soon wear off as they multiplied in the streets, and as we came to know more of the force which propelled them, the negative idea expressed in horseless would naturally give place to the positive idea that these vehicles were propelled by power within themselves. How then would this power be designated, for in it we shall find the clue to the name of the new vehicle.

The motor has been made familiar to the public during the past ten years by its extensive use in the electrical field for light power purposes, particularly that of locomotion. So important is the work it now performs in civilization, that the term has been extended to cover any light power, whether electric or not, as distinguished from a heavy power. For example, a large gas engine doing stationary work is called a gas engine, while a small engine propelling a boat or a vehicle is termed a motor. An engine of the same size and general build might also be called a motor, when used for stationary purposes, but as regards light power used for locomotion there can be no doubt that motor is the correct term. It has been universally adopted by builders of motor boats, and by inventors and investigators in the field of motor vehicles. As we have seen that its use in this new field is merely an extension of a familiar idea, its final adoption to cover the whole field is in accordance with precedent and with the laws of the evolution of language and knowledge.

When the motor idea becomes thoroughly popularized, it will afford the simplest, tersest and most comprehensive term that can be used to describe the vehicle propelled by power. This term will serve as a prefix, not only for all classes of vehicles, but for all boats where small power is required. The noun becomes the descriptive adjective, just as in motorman, street car, dog-cart, cable car, ox-cart, pony-cart, and a thousand other compounds, current and obsolete.

As the word motorman is already in common use to designate a man whose occupation it is to operate a motor which propels a car, it seems quite consistent with good logic and good usage to extend the use of this term to include those whose occupation it will be to operate motor vehicles, whether public or private. In the case of public stages and omnibuses this extension will be easy, but the aristocratic term, "coachman," is likely to prove more obstinate, because of the love of the aristocratic classes for terms which separate or distinguish them from anything public or common.

But if the man whose occupation it is to operate a motor vehicle is to be called a motorman, why may not the term apply also to a man whose occupation it is to run and care for a motor-boat? With the increased demand for motor vehicles and boats will come a corresponding demand for men competent to manage them. Those who take up this work will constitute a special branch of skilled labor, and for the entire class no better word appears than "motormen."

This is the nomenclature for which the editor of THE HORSELESS AGE stands, and in the use of which he will endeavor to set a good example to his brethren of the craft. But the Saxon tongue needs no man's championship. It will win here, as it has won before, on native merit alone. It is the language of poetry and oratory, and, above all, it is the language of business. It is penetrating to the ends of the earth, because it is the strongest, tersest, and therefore the most economical language known to man. Behind it is the invincible law that governs the direction of human energy—that reason seeks the accomplishment of its ends in the easiest possible way—the law that promotes all progress and is ushering in the motor vehicle; the law without which civilization itself could not exist.

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A Criticism and an Appeal to the Carriage Trade.

The November issue of the *Carriage Monthly* contains a leading editorial, entitled "The Horseless Vehicle," which is so mixed with error and inconsistency, that we cannot allow it to pass unnoticed. It is a fair sample of the so-called "conservative" editorial in trade journalism, which breaks every law of logic and whittles language down to a meaningless jargon, lest sometime somebody might insinuate that something had been said. The full text is as follows:

> The present horseless vehicle furore is largely due to the fact that prizes have been offered for power-actuated vehicles that will meet certain prescribed requirements. The assurances of large rewards for a practical motor and vehicle stimulates effort in that direction to the enthusiastic limit. The demonstrated success of these vehicles in France removes doubt from the minds of American inventors. With accustomed confidence and energy they have gone to work to put their knowledge into practice, and furnish a horseless carriage or wagon useful for business or pleasure. Will they succeed? One ready answer is, Why not? But there are certain reasons which may delay for a time the success of the motor carriage, which do not apply to the motor wagon for delivery and general business purposes. Success in this line seems within our grasp, where odor, noise and cylinders charged at high pressure with gas, are not particularly objectionable. In a pleasure carriage they would be.
>
> But it is too soon to speculate or draw conclusions. Our American mechanics, engineers, and carriage and wagon builders have not yet spoken. A few only have impetuously rushed into iron, as it were, some using gasolene, some electricity, but their success or their failure settles nothing. The first page only of the book on horseless vehicles has been opened. The bicycle did not spring into what it is in a day or year. The steam engine of to-day is the product of an evolutionary process not yet ended. So it will be with this new power. To-day's accomplishments are only tentative, good enough to look at and think about for a day, but they will be no more accepted as a result than was the early bicycle or steam engine. There are serious difficulties to be overcome before it will be the carriage builders' turn. That some of the motors now made are capable of propelling vehicles that would be acceptable to and adapted for the ordinary commercial purposes, as for instance, delivery wagons and the like, now seems assured, but immediate progress beyond this line does not seem probable in the light of all the developments at hand. In short, the horseless carriage is likely to be the horseless wagon for some time to come, which wagon will approach the functions of a carriage as fast and as closely as builders' and engineers' sharpened wits will allow.

It seems necessary to remind the editor of the *Carriage Monthly* that this is the year 1896, and not the year 1830 (to go no farther back). Whole volumes of argument are comprehended in this one fact. Facilities for the spread of knowledge are vastly greater than in the earlier decades of this century. Cables, telegraphs, libraries, newspapers, cheap popular literature, steamships and railways have brought us all closer together and give to our thoughts in greater degree than ever before one common bent. As a result of these educational facilities, we have a more intelligent public, and a force of inventors proportionally greater than ever before sought to unravel the secrets of nature. It is a pardonable exaggeration to say that now we have but to touch a button and the gaze of the enlightened world is fixed upon a given problem. Where ten men worked on the development of the steam engine in its early stage, ten thousand are now devoting their energies to the solution of the motor problem. And not only are the workers of the present day more numerous, but they work to better advantage, for they have better tools at command, and the experience of others to guide them in their labors. These conditions never before existed in the history of the world. The comparison of the new motor era to the initial era of the steam engine is therefore entirely misleading. The two cases are not parallel.

The allusion to the bicycle is also open to criticism, though in less degree. When, in his opening sentence the editor used the word "furore" in reference to the present interest in the motor vehicle, it should have reminded him of the weakness of his argument, for there was no "furore" when the bicycle was first introduced into America. Quite the reverse, the machine was looked upon as a toy or plaything for boys, and was not regarded seriously by the adult population. The promotors of this very useful invention labored long to popularize it, and only within the past few years have they reaped the full reward of their energy and perseverance. The eager demand which now awaits the motor manuracturer was denied to them, and as a direct result of this lack of public interest the number of inventors engaged in the field was proportionally less. Public interest is the inventor's stimulus and the guarantee of his reward.

Besides these general conditions, which are alone sufficient to invalidate the position of the *Carriage Monthly*, there is a special reason why the coming of the motor vehicle is timely, fated and sure. The education of the public in matters pertaining to locomotion has been wonderfully rapid within the past ten years. Now, as never before its importance to our civilization is realized. The trolley and the bicycle have paved the way, and it is inevitable that the motor vehicle should follow after them. Under such circumstances, is it any wonder that there should be a "furore" among the people over the new vehicle, and that the "assurance of large rewards" should "stimulate effort in that direction to the enthusiastic limit?"

There are several passages in the above text, where in endeavoring to maintain his equilibrium upon the fence, the writer has fallen into absurdity. For instance, he admits that motor carriages are a "demonstrated success" in France, yet a little further on he states that the success or failure of "the few" who have "impetuously rushed into iron" here "settles nothing." One of these impetuous American inventors rushed into the Chicago Race on November 28th, and settled something in competition with several "demonstrated successes" from abroad. Yet this wagon was not a dark horse. It had been exhibited for months, and written up in newspapers all over the land, so that its merits were known to all who cared to investigate.

In spite of the fact that the "demonstrated successes" abroad are pleasure carriages, and that they have "odor, noise, and cylinders charged at high pressure with gas," he says that these are objectionable features in a pleasure carriage, and declares that the motor vehicle must be limited to a motor business wagon for some time to come.

"It is too soon to speculate or draw conclusions," is his assertion while he speculates and draws conclusions which are wholly unfounded. It is never too soon to speculate and draw conclusions if these conclusions are founded on full investigation, and the earlier they are drawn the more valuable they are, provided they are correct. This is the part of foresight.

"Our American mechanics, engineers, and carriage and wagon builders have not spoken," he goes on to say. That they have not spoken to the editor of the *Carriage Monthly*, is evident, for he is very deaf on the motor vehicle side, but they have spoken to the editor of The Horseless Age, and in no uncertain tone. They speak with confidence and enthusiasm; with a confidence begotten of much already accomplished and an enthusiasm that means the certainty of complete success.

"The first page only of the book on horseless vehicles has been opened."

Here is a frank confession, which explains the editor's dilemma. If he had opened all the pages of The Horseless Age instead of the first only, and studied them carefully, his readers would not have been so ill-advised, and this criticism would have been unnecessary.

"To-day's accomplishments are only tentative, good enough to look at and think about for a day, but they will be no more accepted as a result than was the early bicycle and steam engine."

The bicycle and steam engine we have already considered at some length, and will not repeat the argument. Had the editor looked at and thought about to-day's accomplishments in the motor vehicle line, he would have accepted them as a result, and a very important result. As a *final* result, no. There is no finality in anything of human conception.

That "there are serious difficulties to be overcome before it will be the carriage builders' turn," is perfectly true, and it is also true that the most serious of these difficulties is the indifference and stupid conservatism of the carriage builders' themselves, who seem content to sit idly by and watch while others work, and are likely to begin to "speculate and draw conclusions" when it is too late to do anything else.

Such timid, straddling utterances as this are particularly censurable in an organ of the carriage trade at this juncture, when all signs point to a crisis in its affairs. They blind the trade to the true conditions, and foster the delusion that at some late day this proud craft may reach forth and wrest the prize from others who have won it. Not so! Progress is no respecter of persons or trades. What the previous affiliations of those who rise to do her bidding she cares not. Sufficient that they possess the energy, the brains, the capital, and above all the confidence to fulfil her commands. Without this latter qualification all others are of no avail. Her rewards are for those who deserve them, and from all trades, and all classes the manufacturers and distributors of motor vehicles are being recruited. Even now the bugle call has sounded. The muster roll is called. Willing and able volunteers are responding. These will go out to do valiant service in the cause of Progress, but the sluggards who will not heed the call, and the scoffers, who sneer and pass on, will rouse themselves too late to join the strong and confident army, and will be but stragglers in its rear.

Gentlemen, again have you come to the parting of the ways. At the parting stands a guide post. The signs thereon are plainly legible. Which way will you choose?

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No Fair Weather Novelty.

The determination of the managers of the *Times-Herald* Race to bring off the contest regardless of wind or weather, has settled one very important point. Some of those who had given considerable study to the motor vehicle, had grave doubts of its ability to make headway over ice and snow without some special device attached to the tires. But the feat of the winning vehicles has laid all doubts at rest. The rubber tires proved equal to the emergency, and established the fact that the motor vehicle, even in its present stage of development is no fair weather novelty.

The press of the country has generally recognized the significance of the performance, and, ceasing to regard the motor vehicle as a "nine days wonder," has assigned it to its proper place among the practical inventions of the age. A few editors, however, who looked only at the speed attained and not at the conditions under which it was attained, dismissed the whole affair as inconclusive and abortive.

The editor of the *Utica Press* blandly says:

> "If speed were very much to be desired, two teams of horses, one for the outward and one for the homeward journey, would have made the distance quicker than the best motor cycle. A single team could make 54 miles in a day if the start were made early enough to allow a reasonable rest and feed time at noon. All the apparatus yet devised is effectually balked by bad roads. They run very well on asphalt or macadamized turnpikes in dry weather, but mud and slush are too much for them."

Here is a blunder fit for the joke book. The editor omits the very important item of expense which an additional team of horses would add to the cost of the journey, as well as the equally important item of endurance. If we dismiss the item of expense entirely and take the latter question only into consideration, how does the comparison stand? How long could two teams of horses continue to draw a carriage 55 miles a day *under such conditions of road?*

Those versed in horse-lore will bear out the assertion that such constant service would soon exhaust the stoutest team, while the motor vehicle, unlike the thing of flesh and blood, does not tire, nor does it need grooming and bedding. Day after day it can repeat the same performance with the slight deterioration that must come as a result of constant use even to the most perfect machinery.

For statistics of the life and service of horses in daily use on the road, we must refer back to the days of the stage coach, or consult the street car companies, that now employ or until recently employed them on their cars. From these sources figures may be obtained which will astonish the advocates of the horse. For the animal of which so much poetry and gush has been written, is not made of iron, but is very sensitive and mortal, particularly when put to hard work over city pavements, conditions which are not natural to him, and which he finds it difficult to adapt himself to. On his native heath, free as the wind; at the horse show, petted and pampered by society, occasionally speeding on the driveway among his equine compeers, he is noble indeed, but the poor jades that toil in harness on the farm, and in the city, day in, day out, outnumber these pets of civilization a hundred to one. The pets of civilization we would not molest, but the slaves of civilization we would deliver from their bondage.

Let us have an end of all this talk about the motor vehicle being limited in its use to asphalt pavements. The Chicago Race afforded a public demonstration of what was already known to experts,—that the motor vehicle is capable of travelling over bad roads. The absurdity into which these critics of the new vehicle fall, is, that they expect the motor to make as good time over the bad road as over the asphalt pavement. Do they expect this of the horse? What would become of the occupants of the vehicle, if high speed were attempted over bad roads? And what would become of the horse?

The same wear and tear that sends thousands of vehicles to the repair shop, and thousands of horses to the boneyard before their time, must necessarily be equally destructive to the motor vehicle, but this affords no rational ground for pride either in the bad roads or the misused beast. It is a question of shock and friction which is felt alike by man, beast or machine. The usefulness of the most perfect vehicle, motor or horse-drawn, will always be impaired by bad roads.

Making the Galled Jade Wince.

THE influence of "vested interests" is already seen in the editorials of newspapers, whose previous utterances have been not unfriendly to the new vehicle. A Boston journal, commenting on the "automobile," says that in winter it would have to be provided with "toothed" (spiked?) wheels, to prevent slipping, and this would mean "rough riding and battered highways." The editor then passes on to a eulogy of the horse and a general misrepresentation of the motor vehicle, concluding that while the motor vehicle may come into limited use in cities for hauling freight, "the horse, the bicycle and the street railway will long remain the chief means of local transportation of all kinds."

This editorial was written over two weeks after the Thanksgiving Race at Chicago, in which conclusive proof was furnished that "toothed" wheels are not needed in winter, and that the "battered highways" are much more numerous now, in these days of iron hoofs, than they will be in the near future. No better evidence of the success of the Chicago Race could be found than just such misrepresentation as this. It shows that the enemies of this improvement are convinced of its practicability, and are preparing to contest its advance inch by inch. However unfair their statements, they are really friends of the motor movement, for they encourage investigation. The greatest foe of Progress is indifference.

Rumor Rife With Races.

RUMOR has been busy of late over the races which will without doubt be held in the East next spring or early summer. Persons interested in the promotion of the new vehicle are endeavoring, with good chances of success, to organize a contest over the main road between Utica and Syracuse, or some other prominent points in Central New York. The name of the publisher of a leading newspaper in New York City has also been mentioned as the probable patron of a race to start from or finish in the vicinity of New York. Nothing definite has yet been announced in regard to either of these two projects, nor of several others now on the tapis in different sections of the United States; but in view of the increasing interest on the subject all over the country, it is safe to predict that there will be no lack of contests to stimulate the public mind.

It seems to the editor of THE HORSELESS AGE that an essential feature of every motor vehicle race should be an exhibition held shortly before the race, as is the custom in Paris. Such exhibitions enable the public to get a closer view of the different styles of vehicles, study their mechanism to better advantage, and compare their merits. They also bring out points more important than the break-neck speed, upon which there is danger that the public may concentrate its attention.

The editor will be pleased to receive suggestions regarding the route, rules and regulations of an Eastern race.

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A Co-operative Plan of Manufacture.

A READER of THE HORSELESS AGE in Salt Lake City, Utah, suggests a plan for the co-operative manufacture of motor vehicles, which he believes would be of benefit to all purchasers of motor vehicles. "Prominent men of known integrity" are to be chosen as officers. If a person desires to get a motor vehicle, he or she buys stock in the company equivalent to its price, which to subscribers would be cost price. After the company is formed, purchasers can buy their vehicles at a fair profit to the company, and invest their money in the company by being guaranteed ten per cent. profit or interest. Such a company, in his opinion, could not be crushed out by private companies, because the subscribers or intending purchasers would be interested in its success, at least until they got their vehicles, and then the company would be strong enough to hold its own ground. It would be a godsend to the poor, and would tend to solve the crowded city problem, says our correspondent.

Vast co-operate schemes, like that which is outlined here, are not new in theory, yet the world has yet to see a single one put into practice. They all ignore the fact that every business requires an executive and responsible head, and that abilities of the first order find suitable reward only in untrammeled independence, and in the pursuit of a policy of enlightened self interest unmixed with vague philanthropies. The "men of known integrity" who would officer the enterprise, would undoubtedly draw fat salaries for a time, but it is absolutely certain that the subscribers would get very poor vehicles, if they were lucky enough to get any at all. The inevitable result would be a bursted bubble, and a futile investigation to determine what the "men of known integrity" could have done with the assets.

There is no better way to secure practical vehicles at the right price than through the free competition of independent manufacturers. Depend upon it, there will be no monopoly in the motor vehicle business.

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The Economic Value of Discussion.

THE men of science tell us that the perfect motor vehicle will be a product of evolution, and having resigned the whole matter into the hands of this vague do-nothing abstraction, they proceed to fold their hands and wait for the evolution, forgetful of the fact that the active factor in the evolution of human affairs is man, and that the high office of reason is to assist evolution by working in harmony with its law. This law, briefly stated, is the adaptation of means to ends, or, in other words, a right understanding of the problem, and the choice of the right means to solve it. The chief obstacle to a right understanding of the motor vehicle problem, seems to be the inability of most inventors to dissociate themselves from the horse vehicles with which they are so familiar, and treat the subject independently on its own ground. This persistence of the old idea in the midst of the new is perfectly natural, but its presence is a sign of the limitation of the human intellect, and it undoubtedly prevents the evolution from accelerating into a revolution.

In these enlightened days we have agencies at command which will greatly facilitate the work of evolution. These agencies are chiefly educational, and their influence is felt not only through the dissemination of knowledge on the subject among the masses of the people, but also through the interchange of ideas among the inventors themselves. The teachers, too, need to be taught, for it is by discussion and by contact with other minds thinking in the same channel, that their views are broadened, their errors exposed, and their best thoughts evolved.

This great truth should be taken home by motor inventors and manufacturers. Never before was a better opportunity offered of profiting by a generous interchange of ideas. If the questions at issue are freely ventilated in the trade journals and at the sessions of the American Motor League, millions of dollars can be saved to motor inventors and manufacturers, and to the public, within the next five or six years.

The columns of THE HORSELESS AGE are open for the discussion of all important topics relating to the motor movement.

The Future of the Motor Cycle.

Some manufacturers of bicycles, while believing thoroughly in the future of the four-wheeled motor vehicle, have no faith in the motor bicycle, looking upon the latter as an exercising machine rather than a labor-saver.

A cursory review of the advantages of the motor vehicle will therefore not be amiss.

Numbers of bicycle riders find the work of driving their machines up hill or over long distances rather arduous. They appreciate the delightful exercise of cycling, but the enjoyment palls when excessive fatigue follows indulgence. This is particularly true of middle-aged riders, whose youthful enthusiasm has been succeeded by a more practical habit of mind. Many persons who have long distances to cover daily to and fro, would use motor bicycles for the purpose, especially in hilly regions.

Briefly summarized, tho advantages of the motor cycle are:

1. Lightness.
2. Cheapness, as compared with four-wheeled vehicles.
3. Compactness, so that it can be readily stored by the owner almost anywhere, and is more easily guided through the streets at high speed.
4. The absence of side shake makes high speed possible with safety.
5. A considerable proportion of the population have already acquired the art of riding the wheel, and would have no difficulty in handling the motor.

The exercising feature of the bicycle, while the strongest attraction to many, is not the only feature. Large numbers of riders use their machines mainly to save time in accomplishing distance. To these and to thousands more who are not owners of safeties, the motor cycle will strongly appeal.

This theory is supported by direct evidence in the form of hundreds of inquiries for motor cycles, which have recently been brought to the notice of the editor of The Horseless Age, and also by the testimony of riders with whom he has talked on the subject.

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Rule-of-Thumb Mechanics.

A mechanical engineer, who has undertaken to construct a motor carriage on scientific principles from start to finish, recently consulted several wheel makers on the proper construction of motor vehicle wheels. He went from one to the other without getting the slightest satisfaction. Some of those approached frankly confessed their ignorance of the subject, and others gave him a vast amount of "experience," which his own thorough engineering knowledge told him was false. He then went to a number of carriage and wagon builders of reputation, but his search was fruitless there. He was finally obliged to design a wheel of his own, adapted to his purpose.

The days of the rule-of-thumb mechanic are past. The day of the engineer has come, and if the carriage trade is to do anything in the motor vehicle way, it must begin to study up the text-books. Such ignorance of the mechanical principles underlying the craft is inexcusable.

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Ajax Defying the Lightning.

One of the foremost coachbuilding firms in the country, a firm whose name is the synonym for superior workmanship the world over, held a meeting of directors not long since and decided that rather than apply motors to their vehicles they would go out of business. While a policy of postponement would rather be expected in so old and conservative a house, a radical declaration like this certainly argues a desire on its part to deliberately choose the latter course. The spectacle of Ajax defying the lightning may call forth our admiration in mythology, but in the actual affairs of business the only prudent course is to "get in out of the wet," and get in as early as possible.

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The Horseless Age is focusing the attention of the public upon the motor question; it is bringing to bear upon manufacturers an active and unprecedented demand which is stimulating their exertions; it is educating the inventor to a better appreciation of his task, creating a class of agents and distributors who are eager to perform this necessary service; it is preparing the public for the intelligent selection and use of motors, and enlisting the press in the great and good cause; in short, it is accomplishing all that its publisher predicted or hoped.

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Special attention should be given to the leading article in this issue, entitled "Motors and Fuels," by Hudson Maxim. Mr. Maxim has made a deep study of gases for years, and many new and suggestive ideas will be found in his contribution to motor literature. He has recently returned from England with the specifications of a new motor, radically different from any yet shown, and will be glad to hear from interested parties, care of The Horseless Age.

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"To match the horseless carriage there should be rutless roads," says the *Evening Wisconsin*.

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Maryland has furnished so many of the first things in invention and construction, that it will surprise no one to hear that the first invention for a horseless carriage in American was taken out by a Marylander. It was almost a century ago.—*Baltimore American*.

MOTORS AND FUELS.

BY

HUDSON MAXIM.

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At the present time there is a very great and growing interest throughout the world in the subject of horseless vehicles of all kinds. No one who has during the last twelve months, been in a position to know of the interest in the matter, and the success already attained can doubt that the horseless carriage, or more properly speaking, the motor vehicle, has come to stay.

At this time a few words on the problem of a suitable motor and the subject of fuel may be of interest to your many readers.

That motor will be most successful which will come the nearest to fulfilling the following requirements. Lightness—it must not weigh more than ten and ought not weigh more than five to seven pounds to the horse power. It should be practically noiseless in its operation, and cause a minimum of vibrating disturbance.

HUDSON MAXIM.

It should be adaptable to the use of all kinds of liquid or gaseous fuel, especially gasolene, kerosene and crude petroleum and also acetylene, when that substance can be had at a sufficiently low cost to be available. It should not be dependent upon the use of water, under conditions to admit of the possibility of injury to the motor or its disablement by freezing in cold weather. It must be under the perfect control of the operator or motorman, be reversible, be simple and durable in all its parts, and inexpensive of manufacture.

My brother, Mr. Hiram S. Maxim, and myself, have devoted a great deal of time and attention to the subject of light motors, and it is my belief that we shall all soon see upon the market a motor filling practically all the above requirements, and the motor vehicle, motor car, motor boat will be in common thought as common things everywhere.

ABOUT FUELS.

That fuel will be most used which can be handled and stored with greatest safety, and which can be made to do the most work with the least cost and inconvenience. Kerosene oil and crude petroleum at the present moment lead all others. Gasolene is a very cheap and efficient fuel, but it has the great disadvantage of being so exceedingly volatile at all temperatures that it is dangerously inflammable.

Acetylene has many advantages as a fuel for light motors. It is a gas at ordinary temperatures but may be reduced to a liquid state by pressure at a low temperature. At the present time acetylene cannot be obtained commercially in this country. It is made and sold to some extent in Germany, but its cost is still very high. There will, however, soon be established in this country plants for the manufacture of this substance, under entirely new processes not yet made public, by which its cost will be so reduced as to render it available as a fuel for light motors.

One of the great advantages of acetylene in liquid form is that it exerts a pressure under ordinary atmospheric temperatures of about 700 to 1,000 lbs. to the square inch; having, therefore, an efficiency as a motive agent equal to that of liquid carbonic acid gas, which at the same temperatures exerts similar pressures. This is entirely apart from the advantages which acetylene has over carbonic acid gas, in that it is combustible, and is therefore capable of developing an enormous amount of energy in addition to the energy developed by its evaporation. I compare acetylene to carbonic acid gas, from the fact that much interest has been taken in the use of the latter substance as a motive power.

In all mechanics work is represented by an equivalent expenditure of heat energy regardless of the medium through which the heat produces a given effect or result. In order that carbonic acid gas or acetylene may do work from their expansion, it is absolutely necessary that they extract an exact equivalent of heat from the surrounding air. If either be allowed to evaporate faster than the heat can be absorbed from the air, a portion of the liquid will evaporate, absorbing heat from the balance for the purpose and freezing it solid. To better understand the relative efficiency of carbonic acid gas as compared with other substances as a motive agent, let us compare it with water.

If the normal temperature of the atmosphere, instead of being as at present, were 300 to 400° higher, water would exist as a gas instead of as a liquid. By means of great pressure and by lowering the temperature sufficiently it could be reduced to a liquid. This liquid could be used as a motive power the same as carbonic acid may now be used, the relative temperature of the air being so great as to evaporate the liquid by the absorption of that heat and cause it to do work. It must not be overlooked that it is the heat of the air that does all the work, when carbonic acid or a similar substance is used as a motive power, and as that heat cannot be imparted to the liquid with sufficient rapidity to give it any great amount of efficiency, it is much more practical to use a substance which is a liquid at ordinary temperatures, and apply a desired amount of heat by artificial means to raise its temperature to such a height as to exert a required amount of pressure. Water is the most common, cheap and available liquid for this purpose, and the ordinary steam boiler is a very practical means of accomplishing the desired result.

There is a mechanical truth which it is well for all inventors, engineers and experimenters in motors to remember—the equivalency of heat and motion. Heat is in reality but a mode of motion. All substance in all nature is ultimately composed of atoms which are necessarily perfect solids, and being perfect solids can have no temperature. Temperature of a body relates to the rate of vibrations of its atoms. The specific heat of a body relates to the amount of momentum in vibrations of the atoms of the body. The specific heat of a body is the amount of heat it will absorb or hold; in other words, the amount of motion which may be stored up in it as momentum. Now, therefore, we may draw the following conclusion. A given quantity of heat operating through the evaporation of a liquid and the expansion of its vapor, must in all cases produce an equivalent mechanical effect, regardless of the character of the liquid employed. Water requires more heat than any liquid to evaporate it. Its specific heat is the highest of all known substances. This is compensated for by the light specific gravity of gaseous steam and its great expansive power. Carbonic acid has a very low specific heat and is consequently very readily evaporated. This is offset, however, by the great specific gravity of carbonic acid gas, and the low specific heat per pound thereof. The subject will be better understood by referring to the following data. The specific heat of a gas is the same at all pressures; in other words, the thermal capacity per unit volume is directly as the density. The specific heats of different simple gases are approximately in the inverse ratio of their relative densities.

The law of gases may therefore be expressed thus: all gases have approximately the same thermal capacity per unit volume when compared at the same pressure and temperature, and are consequently equivalent agents per unit volume in the production of work for a given quantity of heat.

If equal quantities of heat be successively added to a gas at constant pressure, the volume of the gas will increase in arithmetical progression.

The above statements are true for the specific heat of gases at constant volume.

We may now state that if equal quantities of heat be successively added to a gas at constant volume the *pressure* will increase in arithmetical progression.

An atom of one gas has the same thermal capacity as an atom of any other gas. The word atom as used here does not refer to ultimate solids but to the ultimate molecule of the gas. What is called in chemistry the atomic weight of an elementary substance, is proportional to the supposed mass of an atom of the substance, and is believed to be proportional to the relative density of the substance when reduced to a state of vapor at high temperature and low pressure. The specific heats of elementary substances are for the most part in the inverse ratio of their atomic weights, or the product of specific heat and atomic weight is approximately constant.

The above mechanical truths may be simply illustrated as follows. A man exerting an equivalent amount of physical energy through a crank or a lever will produce a given result in a given time. What he gains in power by increased leverage he loses in time, and, conversely, what he gains in time by shorter leverage, he loses in power. Now, if a given volume of gas at a given pressure be operated upon by a given quantity of heat, in such wise as to impart its expansive energy directly to a piston, whereby it is caused to strike a blow upon an anvil, the amount of heat imparted to the anvil by the blow, and to the molecules of the striking object, will be an exact equivalent of the amount of heat imparted to the gas to expand it, not taking into account the loss by radiation and friction.

Now, if a quantity of volatilizable liquid be evaporated to produce the above result through the expansion of its vapor, whatever the liquid may be, equivalent mechanical effect is represented in equivalent heat to evaporate the liquid and expand its vapor. Under no conditions can any liquid evaporate or any gas expand without the utilization of an equivalent quantity of heat. Even compressed air in expanding lowers its own temperature and that of its receptacle to a degree representing the exact amount of work done by its expansion.

When a liquid fuel is burned with air, i. e., its vapor is mixed with air and exploded, the work done is due to the elevation of temperature of the mixture, by the combustion of its hydrogen and carbon with the oxygen. The products of combustion being carbonic acid, gaseous steam and free nitrogen, when they are cooled down to normal temperatures, their specific gravity is greater than the mixture before combustion. Consequently the work done is due to the expansion of the gases during the high temperature. Those who have experimented with gas engines have found that the maximum of work is done during the first tenth part of the stroke. The amount of work being represented by the specific heat per unit volume, the volume of heated gases being small, and the specific heat low, the pressure must necessarily fall off very quickly upon the expansion of the gases.

The main thing to be considered in a fuel, therefore, is the volume and temperature of the products of combustion with air. Kerosene oil and crude petroleum being very cheap and easily obtained, are the most available fuels at the present time. Acetylene has an advantage over other hydro-carbons, in that it has so large an amount of latent energy stored up in the tension of its molecules, which is set free upon combustion. It develops much more heat in combustion than is represented by the combustion of its constituent elements, burned independently.

This is probably the reason why acetylene gas is such a splendid illuminant. Being rich in carbon and containing a large amount of latent heat, the carbon particles at the instant of separation by heat from the hydrogen, are raised to high incandescence by the simultaneous liberation of the latent heat.

The Problem Frankly Discussed.

—BY—

M. H. DALEY.

I notice that most people think that all that is needed in this motor problem is a motor which can be attached to an ordinary carriage. I wish to give a few reasons to show the fallacy of this generally accepted idea.

In the first place the wheels of the ordinary carriage are too large, raising the weight of the body and its occupants so high that there is great danger of upsetting at high speed. Then again the tread is too wide. No man running a carriage at fifteen miles an hour can steer it so as to keep it in the track of the ordinary country road, that winds to the right or left every few rods, and in which the wheel tracks are often not more than two inches wide and vary in depth from two to twelve inches, so that a pneumatic tire must necessarily wedge and wear in them.

The front axle of the ordinary carriage swings on its centre in steering, and when an obstruction interferes with the forward movement of one of the front wheels, it takes great power to keep the axle in the proper position to guide the vehicle. If this is to be accomplished by any mechanism known in mechanics or philosophy, the operation of changing it to steer to the right or the left must be done very slowly, therefore obstructions cannot be avoided when the vehicle is going at high speed.

Nearly all the devices which have so far been offered for this purpose are patterned after the method of steering boats or ships, and are too slow for practical use on the motor carriage. *The pivots must be on a line with the point of resistance of each front wheel*, so that the wheel will not be deflected from its course by ruts and rough roads, or other obstructions that may be encountered, and the tread must be about three feet so as to follow in the horse track the same as a sleigh.

In the ordinary carriage the hind axle is stationary, while the axle of a motor carriage should turn with the wheels and the wheels should have ratchets so that they may turn curves.

It is evident when the power is applied to the hind axle, driving both hind wheels, that if an obstruction is met with on one side all the power of the motor will be applied to the wheel obstructed. If the forward wheels are so hung that they work similar to caster reels it is plain that the power of the motor will keep the carriage running in a straight line, for in order to make it run out of a straight line one hind wheel would have to turn forward on the ratchet, and the power would be applied to the other wheel only, which would bring it back again to the straight forward line. This construction makes very easy steering, as the operator has to make use of the lever only in turning to the right or left, the vehicle righting itself to the straight forward line as soon as the power of the hand is removed.

Another important point is the frame. The ordinary carriage frame has to twist to allow the vehicle to conform to uneven roads. This produces such a strain upon the frame as to render high speed impossible. In the motor vehicle we have additional strain from the weight of the motor.

The wheels should rise and fall without twisting the frame. The wheels of the ordinary carriage are built simply to support the weight and resist side thrust. But in the motor carriage the hind wheels must carry nearly all the weight in order to prevent slipping, and as the tendency of the strain of the motive power is to twist the hub, the wheel must be built with tangent spokes to resist the torsion strain, and must be made stronger to stand the side thrust and the additional weight.

On high speed vehicles pneumatic tires are an absolute necessity, and they must be so made as to resist puncture, possess durability and should have a removable band on the outside, so that the whole tire will not be injured by wear, and when the face becomes worn a new band can be put on at slight expense.

It has been my determination to build a vehicle possessing all the requirements I have mentioned, and a motor that can be easily regulated and has few parts to wear or give trouble. I have met with many difficulties. I made three motors before I devised one suitable for a light motor carriage. The last one I believe to be exactly suited to the purpose, and I shall soon commence manufacturing them.

It is important that every possible light should be thrown upon this new industry. The field is big enough for all who can produce any device that will aid in bringing about the desired perfection of the motor carriage. There is no trouble in selling all the practical vehicles that can be manufactured at a moderate price. A motor carriage, to be practical, must be suited to country roads, must run in mud or sand, dust or snow, must be light, strong and durable, and must be easily managed by inexperienced persons. The motor should be as durable and as practical as a watch or clock, and require no further attention than to start it, stop it and keep it supplied with fuel.

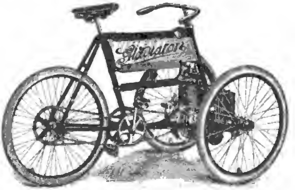
This is no easy task to accomplish, but such are the requirements and such a vehicle and motor must and will be produced.

PARIS NOTES.

The Automobile Section of the Salon du Cycle—Chief Exhibitors.

The chief event in the motor vehicle world of Paris the past month was the Salon du Cycle, one of the most interesting features of which was the exhibit of "automobiles." This section appeared to be the centre of attraction for the fashionable throng, proving that the "automobile" is now more than dividing honors with the cycle. The principal exhibitors in this department were the Gladiator Co., De Dion, Bouton & Co., M. Delahaye, and M. Dalifol & Co. The steam bicycle of M. Dalifol was described in the last issue of THE HORSELESS AGE.

The petroleum tricycle of the Gladiator Company came in for its full share of attention. The two front wheels are steering wheels. Pedals are provided for hard going or for exercise purely, an automatic arrangement locking them in place when they are not in use. The weight of the machine is so distributed that each wheel carries about one-third of it.



The motor, which is set in operation by the pedals, makes about 600 turns to the minute, and propels the machine at a speed of about twelve miles an hour. The cylinder has radiating ribs to facilitate cooling. All vital parts are enclosed in a tight case to prevent the entrance of dust.

The gasolene tank which is fastened to the top of the frame holds enough fuel for a long journey, and is in such a position that it serves the purpose of a carburetor also, the mixture of gases being proportioned to the speed of the motor.

Foot rests enable the rider to sit securely in his seat and admire the landscape as he passes on.

Slacking speed and stopping are accomplished by pressure, light or heavy, upon a pedal controlled by a spring underneath, and acting by means of a lever upon the pinion of the shaft of the motor.

The burned gases are expelled through a large tube without making any disagreeable noise.

The Gladiator Co. will put on the market next year a light quadricycle for two, and a petroleum carriage for four.

PETROLEUM TRICYCLE OF DE DION, BOUTON & CO.

In the petroleum tricycle exhibited by De Dion and Bouton, at the Salon de Cycle this year, the motor runs at 2,500 revolutions without a load, and 700 to 800 with a load. It is of the Otto cycle and has no water jacket, the cylinder being provided with a radiating device, which, when the machine is in motion, is said to free sufficient heat to keep the cylinders cool.

The frame is entirely of aluminum. All the moving parts are on the inside and turn in oil, thus insuring perfect lubrication. The bearing surfaces are of tempered steel. The motor develops three-fourths of a horse power.

The igniting apparatus is positive and regular in its operation. Either dry or liquid cells may be employed to furnish the current and with or without polarization. The cells are attached to the frame out of the rider's way. The motor is regulated by the handle bars. The pedals are used to start the machine, but once in motion these are disused and steering is the only labor required. A slight stroke of the foot upon the pedals sets in operation a brake which acts upon the axles of the wheels and stops the machine.

Changes of speed are obtained by increasing or diminishing the compression.

Behind the frame of the vehicle is the carburetor, which mixes the gases for the explosion.

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PETROLEUM MOTOR OF M. DELAHAYE.

The vehicle of M. Delahaye, which was not completed soon enough to take part in the Paris-Bordeaux Race last summer, is considered one of the best examples of French skill in this line.

One peculiarity of this vehicle which strikes the observer at once is the distance between the axles, which it is said gives much greater stability, reducing the rolling and pitching of the vehicle to a minimum, even on poor roads, and permitting a higher rate of speed with comfort and safety.

The motor, however, is the chief center of interest, for it is of an entirely new construction. It has two horizontal cylinders, and the cranks turned by the pistons operate at an angle of 180 degrees to each other. Hence, when in motion, the parts are in perfect equilibrium, and the jarring that is admitted to be a defect in most of the French motor wagons, is avoided. In fact the motion of the motor is scarcely perceptible to the occupants of the vehicle.

The plan adopted for the transmission of the power from the motor will be understood from the accompanying diagram.

The normal speed of the motor is 450 revolutions a minute and it is capable of 5-horse power. The gas which it consumes is of a density of 700, known as mineral essence in France, and sold by most of the grocers throughout the country.

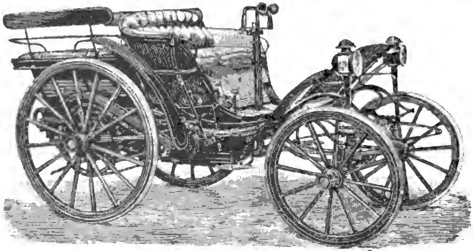
A sufficient supply of gas can be carried in the receiver to last for a journey of nearly 200 miles. The average speed of the vehicle on a level road, with five or six passengers is 18 miles an hour.

The carburetor is automatic. If set in order at the start it requires no further attention. Ignition is effected by an electric spark and the time of the ignition can be so nicely regulated that a range of power is secured seldom seen in a gas motor.

The cylinders are cooled by a circulation of water from a small centrifugal pump. This water, after leaving the water jacket, passes through a series of tubes in the forward part of the vehicle. Coming in contact with the air the water is cooled by radiation and is returned again to the water tank. Consequently a very little water suffices for this purpose.

For quick stopping there are two independent brakes.

Rubber tires are fitted to the wheels.



PETROLEUM WAGON OF M. DELAHAYE.

In the new carriages of Peugeot Freres, the hollow steel tubes of the frame work are used to cool the water which circulates around the cylinder of the motor. The heat radiates from the large exposed surface very rapidly.

An Automobile Club has been organized at Brussels, Belgium. Its objects are similar to those of the Paris Club of the same name.

A race for motor vehicles is among the probabilities in Russia next spring.

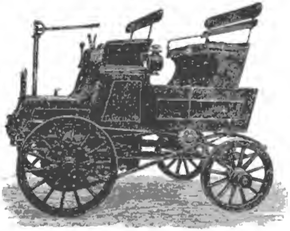
The Lepape Petroleum Wagon.

The leading article in *La Locomotion Automobile* for November, is devoted to the Lepape petroleum wagon, which has a seating capacity for five persons, and to which a two or four-wheeled trailer can be attached by removing the rear seat.

Water for cooling the cylinder of the motor is carried in the panels of the body of the vehicle.

To lessen vibration as far as possible, the motor and framework are entirely independent of the body, and both motor and frame-work rest upon rubber cushions.

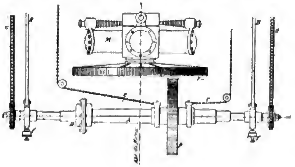
Power is transmitted by friction discs. A single large disc, mounted on a shaft provided with a differential gear, takes the place of all the complicated mechanism ordinarily employed to change speed, stop, start, turn, and secure independent movement of the wheels in turning curves.



LEPAPE PETROLEUM WAGON.

The fly-wheel of the motor which is parallel with the axles, is a large thick plate covered with a special facing next to the motor. Upon this facing engages a friction-pulley or large disc, mounted on a horizontal arbor, which is perpendicular to the axis of the motor. This is the only shaft employed for transmitting power. At one of its extremities is the differential gear, operating two intermediate shafts, at the end of which are attached the pinions of the drive-chains which control the forward wheels.

On the square hollow power shaft slides a long socket upon which the friction-pulley is fixed, and the relative position of this pulley to the axis of the motor determines the speed, which can be varied from O up to the maximum. Reversing is done by bringing the pulley on the other side of the axis of the motor.



Through the hollow shaft and a differential gear this pulley controls the pinions, which, owing to the differential movement, act independently of each other, and even in opposite directions if the vehicle turns a sharp curve. A swinging rod on each side supports the shaft, so that it can easily be brought in contact with the fly-wheel of the motor, or removed from it. This control of the arbor and friction-pulley ensures parallelism with the axis of the motor, and avoids all disagreeable shocks.

The greater the power required to propel the vehicle the tighter the chains will be, and the greater will be the pressure of the friction-pulley on the fly-wheel, thus proportioning the amount of the friction to the power required.

The operator has but to let the friction take hold, and sufficient adherence to prevent slipping is automatically secured.

Upon the forward or driving wheels are mounted toothed sprockets which carry the driving chains. These chains are connected with a pulley, in which are placed the regulators of the spring. Both crowns and pulleys are fastened by bolts to the middle of the spokes of the wheels and give rigidity to them.

The hind wheels are steered by a lever which the operator holds in his left hand, and raises or lowers. When it is lowered the friction-pulley approaches the fly-wheel, and the gears are thrown in. When it is raised, on the contrary, the gears are thrown out, and if this movement is continued the pulley strikes upon a transverse bar and a sudden stop is made. An additional precaution required by the police ordinances.

If the locomotor has been attached to a trailer, which is heavily loaded, small pinions can easily be substituted for those placed at the end of the shaft of the friction-pulley.

At the operator's right are placed the stop-cocks that regulate the motor, and also the accessories, which are kept in a tin box.

The motor makes 400 revolutions, and weighs about 110 lbs. to the horse power.

The ignition is electric.

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Sidney A. Grant's New Motor Vehicle Gearing.

Sidney A. Grant, the well known inventor of Springfield, Mass., is engaged upon a vehicle gearing, which he believes will make it possible for a man to employ one and the same motor for a vehicle and for stationary work. His method of applying power to a vehicle is as follows:

"Just behind the seat is a simple arrangement for holding the engine in position. Running across the upper part of the engine is a shaft with two broad-rimmed wheels at either end. This shaft is connected with the mechanism of the engine and the whole outfit is lifted from the ground and placed in position behind the carriage seat, the broad wheels resting upon the rims of the carriage wheels. The engine is kept from shifting by the arrangement behind the seat, but its whole weight rests directly upon the carriage wheels. The shafts of the carriage are removed and a simple steering head is substituted. If anything happens to the engine all that is necessary is to lift it out of its place in the carriage, attach shafts and hitch in a horse.

"Mr. Grant's idea is that when a man arrives at his place of business he can have the engine lifted out and if he is a printer or a machinist, he can take the engine into his place of business and use the power to operate his machinery, using the broad wheels for pulleys. Mr. Grant says that his device can be applied to any carriage for about $10 and that the method of transmitting the power increases the power of the engine about one horse power. He has a working model of his invention at his home."

In the ordinary motor carriage the power is applied near the hub of the wheel, but in Mr. Grant's invention the power is applied at the extreme lower edge, affording increased leverage.

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Terms and Conditions of the English Motor Vehicle Race.

We reprint from the *London Engineer*, the rules of the motor vehicle contest recently organized by that paper:

Many correspondents have asked us to state the terms and conditions of the competition for the thousand guineas, which as already announced in our columns, we have offered as prizes. They state, with reason, that they are desirous of commencing the preparation of designs for carriages to compete, and that it would be waste of time to formulate their ideas until they know something of the conditions with which the vehicles must comply. Now, under the existing state of the law, no adequate competitive trials could take place. A change is confidently anticipated; but what the change will exactly be it remains with Parliament to determine, and the effect of legislation may be such as to affect the proceedings of would-be competitors.

It is, however, possible to arrive at some definite propositions—propositions that legislation need in no way affect, and therefore we have now the pleasure to publish the preliminary conditions of the competition. The necessary details for carrying out the competition based on these conditions are not immediately called for, and may be left for a little further consideration.

Judges.

The following gentlemen have courteously consented to act as judges:—

Sir Frederick Bramwell, Bart, F. R. S., M. Inst. C. E.; Mr. John Audley F. Aspinall, M. Inst. C. E., Chief Mechanical Engineer, Lancashire and Yorkshire Railway; Dr. John Hopkinson, F. R. S., M. Inst. C. E.

Classes.

The competing vehicles shall be divided into classes, viz:—

A.—Prize 350 guineas for the best mechanically-propelled vehicle to carry four or more persons. Total weight, fully loaded, not to exceed two tons.

B.—Prize 250 guineas for the best mechanically-propelled vehicle to carry one, two, or three persons. Total weight, fully loaded, not to exceed one ton.

C.—Prize 250 guineas for the best mechanically-propelled vehicle to carry one ton of goods or parcels. Weight, fully loaded, not to exceed two tons.

D.—Prize 150 guineas for the best mechanically-propelled vehicle to carry five cwt. or less of goods or parcels. Weight fully loaded, not to exceed one ton.

The judges shall have power to divide any prize in case of vehicles proving of equal merit.

Propelling Power.

Any method of propulsion other than muscular power may be employed, provided it be contained in the vehicle.

No oil or other liquid used in any engine, whether for the production of an explosive mixture, vapor, or for fuel, shall have a lower specific gravity than 0.8, or a lower flashing point than 73 deg. Fah.—Abel's test.

Competition Trials.

The trials shall consist of a run of not less than 100 miles out and 100 miles home; or a total of not less than 200 miles, over a course to be subsequently announced. On the completion of the run, the vehicles will be called upon to make such further runs, or to undergo such further trials, as the judges may deem necessary.

Speed.

As the attainment of high speeds is not the object sought, it has been determined that nothing over 10 miles an hour shall count. That rate of progression should be sufficient for all practical purposes, and racing among the competitors would be objectionable. The competitors may go as they please, at any speed they think proper, running continuously day and night, or stopping as they think best. But no speed over 10 miles an hour will be placed to the credit of any competitor. That is to say, of two vehicles, one making the run of, say, 200 miles in 20 hours, and the other making it in 18 hours, the one shall be regarded for the purpose of the competition as equal to the other in the matter of speed.

Entries.

Any maker, seller, or inventor of a vehicle may enter it for competition; but no vehicle shall be entered by more than one individual. Partnerships, or corporations making or selling, or joint inventors when there is more than one, shall for the purpose of this competition be regarded as "an individual."

We believe that we have now supplied all the information that can be needed for the preparation of designs. The limit of weight—two tons—is that fixed in the Bill brought in by Mr. Shaw-Lefevre during the last Parliament, and seems to meet the conditions fairly well. Therefore we have adopted it. It only remains to add that the competition can scarcely take place at an earlier date than October, 1896 This will allow intending competitors nearly twelve months for designing and making experiments.

All communications concerning this competition must be addressed to the editor of the *Engineer*, Norfolk Street, Strand, W. C., and bear on the envelope the words "Road Carriages."

SIR DAVID SALOMONS.

Sir David Salomons, the English Motor Exponent.

Sir David Salomons, the high priest of the motor vehicle cult in England, has an embarrassment of riches in more senses than one. He is abundantly blessed with this world's goods, has had high political and social honors conferred upon him, and is a member of about all the scientific societies in England and many in foreign lands. To the cause of science he devotes all the time he can spare, from his multifarious business and social obligations, and has written acceptably to the whole learned world on electricity and other subjects. Sir David's father was Lord Mayor of London, and he himself enjoys the distinction of filling the same office in the city of his residence, Tunbridge Wells. In him the motor vehicle has an able exponent, who has already done much, and will do more for civilization's new cause.

London Briefs.

An exhibition of motor vehicles is to be held in the Imperial Institute, London, during the second week in January.

The Maxim-Nordenfelt Guns & Ammunition Co., Limited, of London, England, have definitely decided to go into the manufacture of motors and motor vehicles of all kinds; also the manufacture of boat motors and motor boats. This company are the manufacturers of the famous Maxim automatic guns, the largest manufacturers of fixed ammunition in the world, capitalized at £2,000,000 sterling, and employing in their various factories upwards of 2,500 men.

At London, on November 27th, H. H. Cunyngham read a paper before the Society of Arts, entitled "Locomotive Carriages for Common Roads" He first reviewed critically some of the road carriages produced previous to 1861, in which year Parliament passed the first bill pertaining to road locomotion, and put an effectual damper on the progress of invention in this line. He then passed on to the French automobiles, giving them the credit of reviving the interest in the subject, but stating that he believed there was much room for improvement. Among other things he was surprised to see the cog wheels made with cast teeth instead of epicyclic teeth cut from the solid, which are found in good machinery. Hitherto the method of construction employed was to take a carriage and fit into it an engine contrived for some other purpose. This method he was convinced would be found quite erroneous. To obtain a good carriage it would be necessary to start from a fresh standpoint and design the whole machine *de novo*.

He then touched upon petroleum bicycles and tricycles, regarding the latter as a more practical form of vehicle than the former.

In the discussion which followed, Sir F. Bramwell, Mr. Shaw Lefevre, Sir David Salomons, Mr. Hiram Maxim and the Comte de Dion took part.

A meeting was called at London, last month, to consider ways and means of promoting the cause of the motor vehicle and, particularly, to agitate for the abolition of the present adverse laws that stand in the way of its introduction in England. The author of the call and the president of the meeting was Sir David Salomons, who recently organized the motor exhibition at Tunbridge Wells. Sir David in his remarks emphasized the fact that so long as the present laws were allowed to remain on the statute books, capital would not be invested in the manufacture of motor vehicles, nor would purchasers of such vehicles care to run the risk of being brought before a police court every time they ventured upon the highway.

Among the notables present was the president of the Institute of British Carriage Manufacturers, and out of the deliberations of this preliminary meeting has come an organization called the "Self-Propelled Traffic Association," whose general object is to be the promotion of the new industry. For immediate work a committee of thirty was appointed to wait upon the Secretary of the House of Commons and endeavor to secure such a modification of the old "locomotive" law as to legalize the use of motor vehicles. Some opposition is expected from those interested in the horse business and kindred lines, but the propaganda for the motor is led by men of high standing in the community, and as the people too are beginning to feel the enthusiasm, the victory of the progressives seems near at hand.

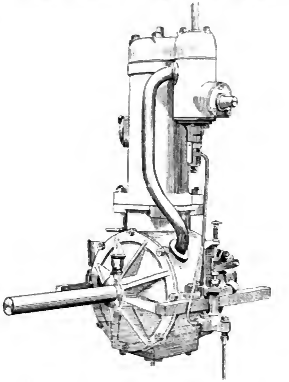
In the play of "Cinderella," given at Drury Lane Theatre during Christmas time, Cinderella's carriage was a strictly up-to-date motor carriage, operated by electricity, and resplendent with the glow of several hundred electric lights.

Several new companies have recently been organized in England to manufacture motor vehicles. Among them are the Horseless Car Co., Limited; the Automotive Syndicate, Limited; the Horseless Carriage & Motor Cycle Co., Limited; the English Automobile Horseless Carriage Syndicate, Limited.

The Daimler Motor Syndicate, 95 Billiter Buildings, E. C., who control the Daimler patents in England, have issued a circular illustrating seventeen different kinds of vehicles propelled by their motors. The prices quoted range from £190 for a one-seated vehicle up to £262 for a delivery wagon. They announce that they will soon exhibit petroleum vehicles which make no perceptible vibration or noise.

The Facile Carriage Motor.

Under this title the Britannia Co., Colchester, England, have just brought out a new carriage motor, which is patented in the United States as well as in England (Gibbons' patent).



FACILE CARRIAGE MOTOR BRITANNIA CO., COLCHESTER, ENG.

The fuel is ordinary kerosene, and no ignition tube or electric sparking apparatus is required, the ignition being automatic after a few moments' application of the lamp at starting.

No vaporiser is used, and a separate explosion chamber prevents the cylinder from becoming overheated. One valve only is used, the oil being injected directly into the cylinder.

The waste heat is utilized to heat the ingoing charge, thus reducing the quantity of water required to keep the cylinder cool.

This motor is said to be very simple in its construction and easily cleaned. The one illustrated here develops three brake horse power, and is offered for launches as well as carriages.

AMERICAN MOTOR LEAGUE.

The second meeting of the American Motor League took place at 335 Dearborn St., Chicago, November 29th, with Dr. J. Allen Hornsby in the chair.

H. D. Emerson was elected secretary *pro tem*. The first business before the organization was the report of the committee appointed on November 1st to draft a constitution. The committee presented a draft of a constitution, which was finally adopted in toto.

The purposes of the organization are thus set forth:

"The purpose of this association shall be advancement of the interests and the use of motor vehicles. This shall be done by reports and discussions of the mechanical features, by education and agitation, by directing and correcting legislation, by mutual defense of the rights of said vehicles when threatened by adverse judicial decisions, by assisting in the work of constructing better roads, better sanitary and humane conditions, and in any other proper way which will assist to hasten the use and add to the value of motor vehicles as a means of transit."

Persons of either sex, who have attained the age of 18 years, and are friendly to motor interests, are eligible to membership.

Membership consists of both active and honorary members. The active members are required to pay an initiation fee of $2.00, and an annual fee of $1.00, payable in advance. Applications for membership are received by the secretary.

A vice-president is to be elected from each state having more than 100 members, his duty being to supervise the work in that state, and report upon it to the president.

Meetings for the election of officers are to be held annually.

The constitution may be changed by a majority vote of all members.

No president was elected, but the following officers were unanimously chosen:—C. E. Duryea, of Illinois; H. D. Emerson, of Cincinnati; H. G. Morris, of Philadelphia; and Hiram Percy Maxim, of Connecticut, vice-presidents; Dr. J. A. Hornsby, secretary; and Charles B. King, of Detroit, treasurer.

H. H. Kohlsaat, proprietor of the *Times-Herald*, was elected an honorary member.

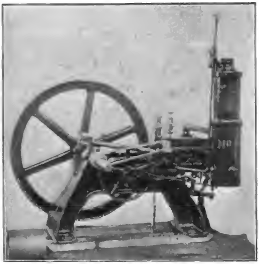
At a meeting of the Board of Commissioners of Lincoln Park, Chicago, held December 18th, Dr. J. Allen Hornsby presented a petition from the American Motor League, asking that motor vehicles be allowed the same right of way on the roads and drives of the park as was accorded to other vehicles. The president of the board decided that the motor vehicle was not quite far enough advanced yet to be entitled to full privileges, but he realized that it would very soon have to be admitted.

The Best Gas Engines.

Daniel Best, of San Leandro, Cal., is the inventor of a gas engine which consumes gas, gasolene, kerosene, or crude petroleum, and is claimed to be the most economical gas engine on the market, costing but one-tenth of a cent per hour for each horse power, when crude petroleum is used as a fuel.

The Best Engine is of the horizontal type, and has a water jacketed head to protect the spark spring and electrode posts. All sizes from 14-horse power down are made with single cylinders, and all from 16-horse power up have double cylinders of balanced construction. In the smaller sizes, 2 to 3-horse power, the cylinders and frame are in one piece, but in the larger sizes the cylinders are detachable. Water jackets are employed for all sizes.

One of the improvements claimed is the water jacketed head or chamber containing the sparking device, which is so protected from the heat as to preserve the temper in the spark spring.



3 H. P. BEST CRUDE OIL ENGINE.

Another peculiar feature is the gas generator, by which more gas is obtained from the same amount of gasolene, and no residue is left; and better results can be obtained from a low grade of gasolene, kerosene, or crude petroleum, than from city gas.

In this generator the oil is vaporized drop by drop, being pumped in from a tank by an automatic pump only as required by the engine. The heat of the exhaust is utilized to vaporize the low grade oils, thus effecting a considerable saving.

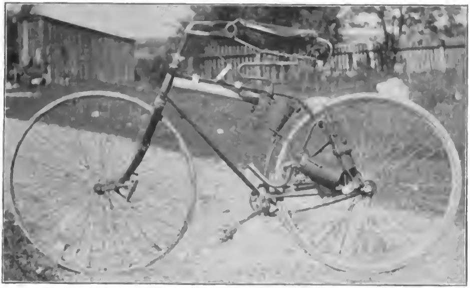
The sparking device is said to be very reliable and can be so regulated as to produce the spark at any part of the stroke.

The crude petroleum of California is of two kinds, one having an asphalt base and the other a paraffine base. The over-product of combustion in the latter variety is an excellent lubricant, so that no lubricating oil is required when the engine is running on this oil.

The manufacturers, the Best Mfg. Co., San Leandro, Cal., publish the following table of results obtained from the use of different oils in this engine:

Coal Gas,	ten hours' run, 1,000 feet........		$2.00
Gasolene (74°)	" "	8⅞ gals. at 14c.	1.25
Coal Oil	" "	7½ gals at 10c.	.75
Crude Petroleum, asph. base, 28°,		16 gals. at 3c.	.48
" " paraffine " 36°,		13 gals. at 5c.	.65
Distillate,		7½ gals. at 4c.	.30

On the crude petroleum with asphaltum base they had an over-product of seven gallons of asphaltum, which at the market price of 3 cents per gallon is worth 21 cents. This deducted from the first cost of the crude petroleum for ten hours' run leaves a net balance of 27 cents. And from the crude oil with a paraffine base they had an over-product of three gallons of good lubricating oil, which they estimate conservatively at 20 cents per gallon, making 60 cents. This deducted from the first cost of the crude oil leaves a balance of 5 cents, total cost of running ten hours. The above results hold good in the large size engines, as to the amount of oil consumed per horse power.



GASOLENE MOTOR CYCLE. NELSON S. HOPKINS, WILLIAMSVILLE, N. Y.

It will be readily seen that the operation of these engines with crude petroleum reduces the cost of operation to a minimum. Crude petroleum with paraffine base at $\frac{1}{10}$c. per horse power per hour; on crude petroleum, asphaltum base, ½c. per horse power per hour; on domestic coal oil, 1½c. per horse power per hour, and on gasolene, 2½c. per horse power per hour.

The Best Engines have been successfully used as motors for boats and street cars.

* * *

Nelson S. Hopkins' Motor Cycle.

The accompanying cut will give a fair idea of a motor cycle or "go devil," recently built by Nelson S. Hopkins, of Williamsville, N. Y., a mechanical engineer of considerable experience.

The motor shown in the cut is one of the latest design and was intended solely for laboratory experiments to gather data as to the amount of power required and the best proportions for a practical cycle motor. It is considerably larger and heavier than is required for a wheel, and is the outcome of a great amount of study and costly experiments. Mr. Hopkins has built a similar motor with all attachments, weighing nine and one-half pounds and of sufficient power to propel the rider over moderate grades. The motor is of the gasolene type and uses compression to a great extent.

Next to the head is the aluminum reservoir, which has sufficient capacity to supply the motor for a seventy-five mile run at as high a speed as any man cares to ride.

From here the oil is conveyed by a small pipe to a valve which is operated by the light rod terminating in front of the saddle. This valve will start, regulate the speed and stop the motor, and is the only part requiring to be used by the rider.

From here the fluid is conveyed to the carburetor, automatically mixed with the requisite amount of air, drawn into the compressor and then forced into the explosion cylinder, where at the proper moment it is ignited by an electric spark.

At the back of the shaft is a small steel gear wheel, which runs with the larger one of phosphor bronze, attached to the hub of the wheel. This larger gear is movable, attached to the hub and so arranged that the motor can be entirely disconnected from the running gear of the wheel and allow the use of the pedals.

By the use of two cylinders it is possible to get an impulse at every turn of the shaft and by means of the gears the speed of the wheel is reduced so as to give a very smooth running machine. There is not the least jerky motion noticeable.

It is impossible for the wheel to be run without the rider upon it, and should he fall, it would stop of its own accord.

All the working parts of the machine, except the gears which have a cover, are either enclosed or are of such construction as to be unaffected by dust or dirt.

The motor is not as yet ready for the market, but arrangements are being made to have it manufactured at an early date.

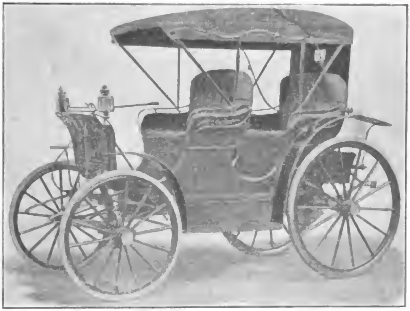
Mr. Hopkins has also devoted considerable time and money to the motor carriage question and promises to furnish a photo and description of one in the near future. He is also engaged upon a 75-horse power gas engine of new design.

The Benton Harbor Motor Carriage.

The Benton Harbor Motor Carriage Co., Benton Harbor, Mich., are out with a brand new motor carriage, which is the result of several years of expert study.

After experimenting with steam and electricity they finally abandoned them both and adopted the construction illustrated here.

The motor, which uses gasolene as a fuel and generates 7½ horse power, is concealed from view under the seats, so that the general appearance of the carriage is as little changed as possible. The vehicle is so constructed that it will run over any ordinary country road at a speed of from 1 to 23½ miles an hour, according to the condition of the road, without making any more noise than an ordinary horse-drawn conveyance.



MOTOR CARRIAGE. BENTON HARBOR MOTOR CARRIAGE CO., BENTON HARBOR, MICH.

There are no exposed chain connections or gearing to catch the dust or mar the appearance, and there are but two running gears, one of which is of rawhide to prevent noise.

The rear wheels are 4 feet in diameter and are fitted with 2½ inch pneumatic tires. The front wheels are 44 inches in diameter and are fitted with 2-inch pneumatics. The front wheels are pivoted at the hub.

One lever does the steering, changes speed, etc. If the lever is raised the carriage goes backward; if it is moved back to a lever position the brake is applied; if moved a little below the horizontal the carriage starts forward, gradually gaining in momentum as the lever is depressed.

The motor is of the double cylinder variety, balanced by a double crank, and connected to an inclined shaft, which drives the rear axle by a beveled pinion, which is connected in a case and runs in a ball-bearing, keyed to the hub of the rear wheels.

The motor maintains a regular speed through the action of a centrifugal governor, controlled by the quantity of gasolene used.

The total weight of the vehicle, including fuel and water for a 300 mile run, is about 1050 pounds.

A factory has been fitted up for the manufacture of these vehicles, which will be made in two grades, one of finest materials and workmanship, the other of substantial construction but less elegant finish.

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Dr. Booth's Motor Carriage.

W. Lee Crouch, of the Pierce-Crouch Engine Co., New Brighton, Pa., made a test of a vehicle motor last month with very satisfactory results. The vehicle was built by the Fredonia Mfg. Co., of Youngstown, O., for Dr. C. C. Booth, a physician of the same city, whose interest in the subject of motors was mentioned in our last issue.

The motor, which is of Mr. Crouch's invention, weighs 134 pounds, is very compact, and develops over three horse power. The vehicle was a trifle too heavy for a motor of this type, weighing 1,250 pounds, but during the tests a speed of eighteen miles an hour was attained, and unpaved grades of 12 per cent. for a distance of 600 or 700 feet, were surmounted at the rate of four miles an hour. On paved streets, grades of the same degree over 1,200 feet in length, were accomplished at the same speed. On grades of 5 per cent. a speed of twelve miles an hour was reached.

On country roads, where the mud at this season is very deep, little difficulty was experienced, and in one spot where the mud was up to the hub of the front wheel, the motor managed to pull through.

The Pierce-Crouch Co. have established a wagon motor department, and will soon be prepared to fill orders.

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Growing Interest in Canada—Surprise in the Motor Line Promised.

Toronto, Jan. 5th.

There is a great deal of interest taken in Canada in the new means of locomotion. For a long time the people here were rather skeptical on the subject and were perhaps a little apt to speak of motor vehicles, flying machines, and the famous Keeley motor, as being all in the same class. Even the French road race did not bring the matter home to them. Recent events in Chicago, however, have opened all eyes to the possibilities which the future holds for the men who place a workable machine on the market at a price which will make it a real competitor of the horse. Everyone is on the look-out for the coming motor, and the man who enters the market here with a thoroughly workable machine can have a million dollars at his back in twenty-four hours. It is a recognized fact that the people of Ontario want motor vehicles, and they want them right away.

Just who the coming inventor will be is as yet purely a matter of conjecture, but it is very possible that it may not be an American. There is at present in Toronto a motor which seems to be the marvel all are waiting for, and those who have been favored with inside information on the subject believe that the Canadian inventor is the coming man. Your correspondent has been promised definite and complete details of the new claimant at an early date.

A number of English firms are in communication with the leading motor enthusiasts here, and everyone is looking forward to the coming Canadian exhibition of motor vehicles with great interest. The exhibition was first proposed by the *Canadian Engineer*, a technical journal in Toronto, which has given a great deal of space to the subject of motors lately, and the proposal was warmly seconded by a number of leading journals. The location of the exhibition is still unsettled. Toronto, Hamilton and Montreal are all eager to secure the prize. At present things are looking Montreal's way, as the British Empire Exposition is to be held in that city from May to September, '96, and promoters are naturally anxious to add so novel an attraction to their program. Wherever it is to be held, it is sure to be a success. Many of the motors which are now at an experimental stage will, by that time, be in shape for a practical exhibition of their powers, so that the number of machines exhibited is sure to be very great.

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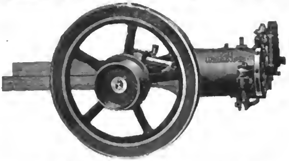
The Underwood Vehicle Motors.

F. M. Underwood, inventor of the Underwood gas engine, and manager of the gas engine department of the Frey-Sheckler Co., Bucyrus, O., is greatly interested in the motor vehicle question, and is building two types of motors for this purpose—one, which is illustrated here, and another not yet exhibited, which will embody a number of new features.

The motor here shown is the regular Underwood model, minus the base, which is used for stationary and marine work. It weighs about 180 pounds, can be run at from 100 to 500 revolutions per minute, and is capable of propelling a vehicle carrying four persons.

The new Underwood vehicle motor will be of entirely new construction, consisting of a double crank, two connecting rods, two valves, and one cylinder. The two pistons will move in opposite directions, making a balance so perfect that the inventor claims the motor can be suspended on wires from any point without causing more vibration than a sewing machine. The gases are compressed, fired and separated in opposite directions, thus saving weight, doing away with the cylinder head, and avoiding vibration.



The speed of the motor can be varied from 100 to 1,000 revolutions per minute.

This new motor, which will be built expressly for vehicles, will weigh about 120 pounds for three horse power, and will be called the American Vehicle Motor.

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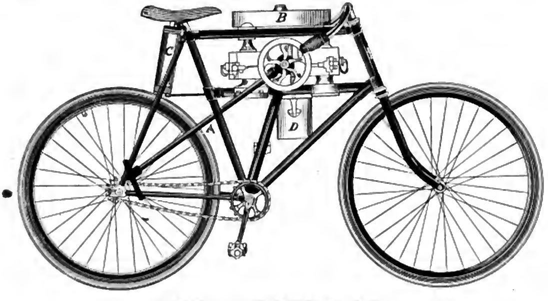
A General Utility Motor.

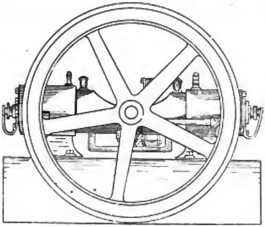
G. F. Eggerdinger, of New London, O., and G. R. Swaine, of Cleveland, O., are the joint inventors of a gasolene motor which they propose to use for the propulsion of bicycles, boats, and for stationary purposes.

The whole motor stands within its fly-wheels, a 1-horse power occupying a floor space 5 x 14 inches, and weighing from 15 to 18 lbs., and it can be taken off from a bicycle and attached



MOTOR CYCLE. G. F. EGGERDINGER AND G. R. SWAINE.

to a launch carrying from four to six passengers in less than thirty minutes. The changes necessary to employ the motor for stationary purposes, can be made in about the same time. In construction the motor is very simple. It has no trunk pistons, and no connecting rods. There are two cylinders, which have two short pistons and piston rods connected to a yoke operating the crank. The piston rod travels straight across from one cylinder to the other and gets an explosion at either end. Hence the action is much like that of a steam pump, and the speed possible to attain is very high.



The first illustration shows the manner in which the motor is applied to a bicycle.

A is a small shaft running from the motor to the rear wheel, and operated by beveled gears from the motor and a worm-gear on the rear wheel.

B is the gasolene tank which holds enough for a journey of 75 to 100 miles.

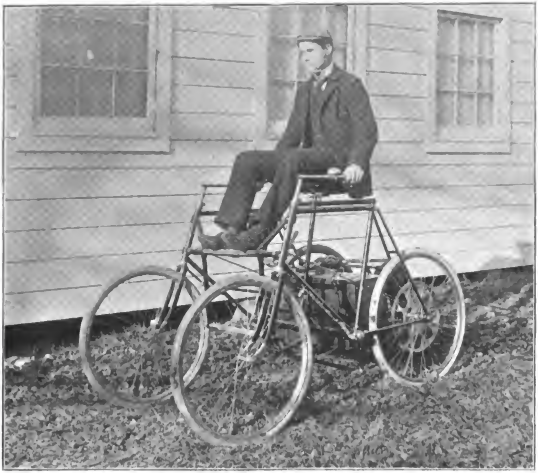
C is the spark coil, and D is the battery. The motor is controlled by a small spring under the handle bar.

The construction of the motor is such that on level roads only one cylinder may be used, but when hills are encountered both cylinders are brought into service.

* * *

The Riker Electric Motor Cycle.

Andrew L. Riker, president of the Riker Electric Motor Co., 45-47 York Street, Brooklyn, N. Y., has just completed an electric motor cycle, an illustration of which is here shown.



ELECTRIC MOTOR CYCLE. ANDREW L. RIKER, BROOKLYN, N. Y.

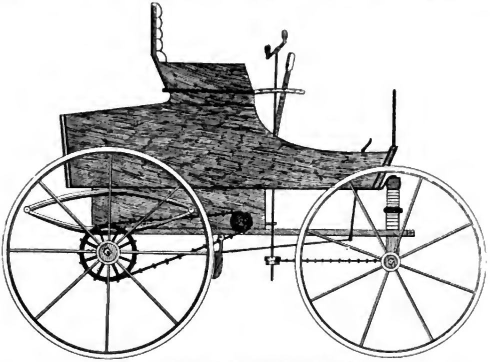
The vehicle weighs 310 lbs., carries one person at a speed of 12 miles an hour, and is capable of maintaining this speed for four hours on one charge of battery.

There are two motors of half-horse power each, independently geared to the rear wheels, and weighing complete 24 lbs. each.

The battery, which is composed of special light cells designed for this purpose, weighs 135 lbs. During a test recently made at Stamford, Conn., a hilly country, the motor cycle made 15 miles over ordinary country roads, up hill and down, without betraying any signs of weakness in either motor or battery.

The vehicle shown was built for experimental purposes only, and consists merely of two standard bicycles joined firmly together. In constructing this type of vehicle for the market several changes will be made. The seat will be lowered and enlarged, and the frame will be so changed as to permit of its use by ladies.

The electric apparatus is the invention of Mr. Riker, and the Riker Co. expect to place upon the market shortly electric cycles and carriages of all descriptions.



MOTOR WAGON. LUCIUS B. PACKARD, SALEM, MASS.

Lucius B. Packard's Motor Wagon.

Lucius B. Packard, a wheelwright of Salem, Mass., has just completed a light motor wagon, on which he has been engaged for two or three months. He has confined his attention to the application of the power to the vehicle and to general construction, and has purchased a 2-horse American motor to furnish the power.

The weight of the vehicle complete is only 450 lbs, its total length about 6 feet, and the length of the body 3½ feet. The wheels are of hickory and the body of white wood. The forward wheels are 30 inches, and the rear wheels 34 inches in diameter. A regular buggy top can be adjusted to the seat when desired.

The body rests upon two rear springs and one forward spring, fashioned after those used on light buggies. The forward axle is stationary, but the rear axle revolves.

Speed is regulated by a lever at the right hand of the operator. When the lever is erect the power is off, though the engine is still running. Moving the lever forward increases the speed, and pushing it backward decreases the speed. A small lever in the rear of the seat is for the purpose of backing the carriage.

The steering apparatus is the usual wheel-lever. The brake is operated by the foot, and is in the forward part.

The power is transmitted by a ratchet chain, running on a small sprocket wheel, which is connected by the chain with a sprocket wheel one foot in diameter. The tires are made of common steel, and Mr. Packard believes he has a simple, cheap and effectual method of preventing slipping.

The wagon was made according to Mr. Packard's ideas, and is already sold. Should the vehicle prove successful a stock company is to be formed for the manufacture of them. Mr. Packard has already applied for several patents on the construction. He is an ingenious mechanic. He made and rode the first velocipede in Peabody, Mass., 27 years ago, and in 1877, he made the first bicycle manufactured in Salem, a 50-inch wheel, with rubber tires.

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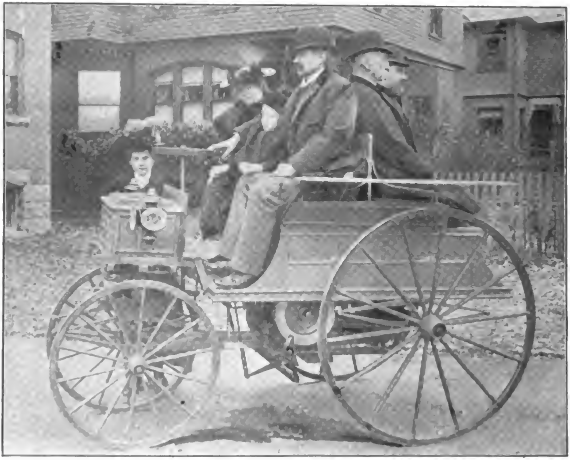
Tea Talk with A. H. Overman.

The editor of THE HORSELESS AGE, recently visiting the factory of the Overman Wheel Co., Chicopee Falls, Mass., at that afternoon hour when tea is served to all the employees in the office, had the pleasure of a chat with Mr. A. H. Overman over a cup of the delicious beverage brewed by his chef.

The subject nearest to the editor's heart of course, was motor vehicles, and he was not surprised to find that the popular subject occupied no small share of Mr. Overman's thoughts. In fact, the energetic and far-sighted manufacturer of bicycles seemed to have the future full within his ken.

In reply to a general question as to what importance he attached to the present motor movement, Mr. Overman said:

"There are few people able to foresee the changes which will rapidly be brought about by the introduction of the motor vehicle. Hay and grain fields will be blotted out and turned to other agricultural uses; cities will spread out, and highways now sparsely settled, will be lined with houses. Trolley and cable cars will find a new competitor, and the cost of locomotion will be so reduced that all will share in its benefits.



MOTOR TRAP. HENRY R. BIRD, BUFFALO, N. Y.

"When the time comes, as it soon will come, when a man may own a light motor carriage which he can keep in a small out-house, or even in his cellar, ready at a moment's notice to carry him far or near, it is difficult to foresee all the changes that will result.

"I expect to see public conveyances operated by motors, running from our factory to Springfield carrying passengers at a nominal fee, and landing them just where they wish to go, thus avoiding walking from street railways to one's destination."

Mr. Overman continued in this strain: He said he had little faith in the motor bicycle, but believed there is an almost unlimited demand for a light motor carriage of bicycle construction, that can be sold at a reasonable price. He is preparing to enter extensively into the manufacture of vehicles of this class. With a factory thoroughly equipped for the production of any kind of metal-work, he is in a position to give the same positive guarantee as to quality that now accompanies the Victor bicycle. He wishes to manufacture a suitable motor under a royalty, and would be glad to hear from parties offering motors for carriages.

The interviewer left Mr. Overman's presence convinced of the superior quality of both talk and tea.

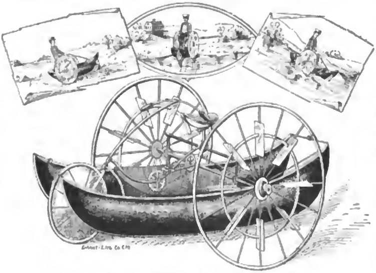
Mr. Bird Building a Third Wagon.

The wagon illustrated on this page is the second of two vehicles constructed by Henry R. Bird, of 217 Linwood Avenue, Buffalo, N. Y. An imperfect description of this vehicle was printed in the December issue of THE HORSELESS AGE, before a photograph could be obtained. Although the gearing of this is much simpler than that of the first one he built, Mr. Bird is now engaged upon a third vehicle which will be simpler still, and considerably lighter. The motor will have no water jacket, and will employ kerosene as fuel. Speed will be controlled by two friction discs at right angles to each other.

Olsen's Combined Boating and Cycling Machine.

Thore J. Olsen, of Chicago, has entered the field of invention to contribute his efforts to the end that this may become a truly "horseless age." This he believes he has succeeded in doing by producing a vehicle adapted to both land and water travel.

The land mechanism consists of three wheels, arranged in the usual tricycle form, slightly modified, however, in the connection and construction of its wheels. Suspended from the axle of the driving wheels is a pair of twin boats, of which the forward end is carried by a yoke from the steering post of the front wheel These boats are connected together rigidly, but may be detached from the tricycle in a moment by opening clasps which secure the boats to the axle. By means of the said rigid connection of the boats, great stability and thereby safety upon the water is obtained, either boat being large and strong enough to require the full weight of two men to sink it. The boats are therefore able to carry the weight of three men with safety, and on account of said rigid connection it is practically impossible for the boats to be overturned.



LAND AND WATER VEHICLE. THORE J. OLSEN, CHICAGO, ILL.

The steering wheel is between the bows of the boats and is webbed between the spokes, thus becoming the rudder for the water craft. The driving wheels are provided with paddles, which are attached to a hoop, so arranged that the spokes of the wheels both aid in holding the paddles in place and also in driving them in the water. These attachments may also be removed from the wheel very readily.

The wheels are driven by treadles forming a chain, and sprocket wheel gearing the same as is now used on bicycles. Thus it will be seen that this device is propelled and managed with the same mechanism, whether it moves in one element or the other.

In this vehicle the traveler may carry his baggage, and travel regardless of floods or bridgeless streams, and the sportsman may take his hunting and fishing tackle and select his shady nooks or pools where the wily finnies most congregate, and invite them to his tempting bait, or the fowler secure his game within the hold of his capacious boat and derive advantages and pleasures which no other single mechanism has yet offered.

The whole device, when completely rigged, without load, weighs from 60 to 80 pounds, and is capable of considerable reduction from this weight.

Recent changes and improvements have added a gasolene motor for propulsion, and a screw propeller in place of the paddles on the wheels, the latter also removable at pleasure, and connected and disconnected from the motor.

The inventor has many letters from would-be patrons in all parts of the world.

John N. Moehn's Motor Wagon.

John N. Moehn, of 1810 Fond du Lac Ave., Milwaukee, Wis., has nearly completed a motor vehicle which he believes is capable of making as high as fifty miles an hour on a good road, and may be brought down to a speed of two and one-half miles, where the driver is confronted with bad roads, bridges, etc. There are features in the vehicle which it is claimed no other possesses. In the angle of a V shaped dashboard is a tank of gasolene, holding about fifteen gallons, from which pipes convey the fluid to a set of three cylinders, underneath the body of the wagon. Each is fitted with an eccentric and piston, which operates a crank on the main shaft about half way toward the rear end of the wagon. At each crank there is a wheel which is connected with another on the rear axle by a chain, and the driver by a system of clutches is able with his lever to throw any one of the latter wheels into action. This varies the speed from two and one-half to thirty-two or fifty miles an hour according to the gear of the wheel put into use.

Mr. Moehn claims that the wagon may be started forward or backward, that when standing still no machinery will move and that the speed may be accelerated without the slightest jar.

Ignition is electric, the batteries being located under the rear seat. The noise of the explosions is deadened by a casing that incloses all the apparatus under the carriage, and by a chemical which Mr. Moehn keeps a secret. This chemical is held about the cylinders by means of a loose net composed of asbestos.

A current of air drawn in from the front end and discharged at the rear, is said to keep the cylinder from becoming over-heated.

The wagon is built for six persons and is made to run either backward or forward, and the steering gear, operated by a wheel on the front platform or seat, will enable it to back and turn in to places where an ordinary wagon cannot go.

Each cylinder is of 3-horse power and thus while going up hill or at other times when the full force is desired, a 3, 6, or 9-horse power is attained. Mr. Moehn claims that his machine can be operated by anyone with a little practice, and is perfectly safe. He expects to complete it about the beginning of March, 1896, when he will make a run from Milwaukee to Fond du Lac.

Charles W. West's Motor Wagon.

Charles W. West, consulting engineer, of Halifax, N. S., is just putting into practical shape plans for a two-seated motor wagon, which he has been maturing for the past three or four years.

The motor has two cylinders of the vertical type. The cylinders, which are of aluminum bronze, are supported by four light steel columns. The bed plate is a light steel casting. Common lamp oil, 150° test, such as can be obtained in any village is the fuel. The motor will be placed in front, and encased in sheet steel.

The body of the wagon, which is intended to seat four or six persons, will be constructed of sheet steel, and the frame of angle and channel steel. The wood work will be polished mahogany, and all the steel work will be painted and grained in oak finish.

On each side of the motor will be a copper tank, one for oil, and the other containing water for cooling purposes. These tanks will hold a supply sufficient for a 100 mile run.

The wheels will be of English oak with hubs of gun metal. Oil feeders and tubes will lead to each wheel to keep it oiled while in motion.

Under the front seat, shelves will be provided for dishes, cooking apparatus, and provisons enough to last four persons four days. Under the rear seat will be the tool box also containing spare parts and bolts for the motor, and thin rubber clothing to protect the passengers in stormy weather. As a further protection against inclement weather, the wagon will be provided with a canopy top and water-proof curtains.

A pole and whiffletree will be attached to the wagon underneath, so that in case a serious breakdown occurs on the road, horses can be hired anywhere to haul the wagon to the nearest town.

Four speeds will be provided.

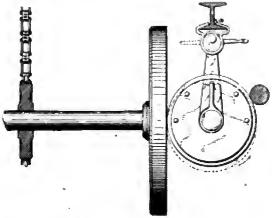
Macdonald & Co., Limited, the largest manufacturers of the lower provinces, will build the wagon for Mr. West.

* * *

The Alberger Power Transmitter.

This novel device is offered for running all kinds of vehicles, either light or heavy. It is exceedingly simple in construction, and will add but little weight to the vehicle.

The cost of running a vehicle with this device is claimed to be very small, as it economizes power and thereby greatly reduces the cost of fuel.



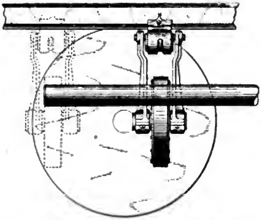
Its application for road wagons has been fully demonstrated by a practical test, with good results, and the owner is now considering a design for a road wagon, which, if satisfactory, will be completed and ready for trial in the Spring.

The following brief explanation will convey some idea of what the inventor believes the device capable of doing.

1st. It is a novel, noiseless, variable, speed, friction gearing.

2nd. It is especially adapted for transmitting power from gas motors, whose speed cannot be changed for some purposes.

3rd. The movement of only one lever instantly changes, reverses, disconnects or changes the pressure of the frictional contact when necessary.



4th. The wearing surface being of paper or leather, is easily and cheaply renewed.

5th. The position of the wheels and lever are such, that the contact of the idler against the face of the disk is almost automatic, the pressure increasing or decreasing as the load is thrown on or off.

6th. Unlike other devices that are obliged when slow speed is required, to be in frictional contact near the center of the disk, in this the contact would be at the outer edge of the disk, where greater power can be obtained.

7th. It can be used on any machine where a variable or reversible speed is desired.

The patentee is J. T. McCready, Buffalo, N. Y.

* * *

Morris & Salom's Prospectus.

Mr. Morris gives us a Glimpse of the Future.

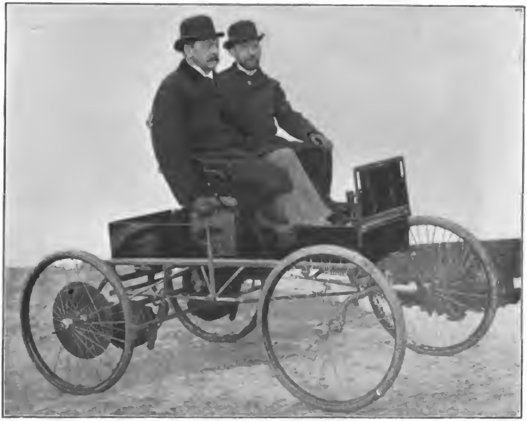
Morris & Salom, of Philadelphia, whose "electrobat" won the gold medal at Chicago, on Thanksgiving Day, will organize a company in Philadelphia for the manufacture, sale, and rental of electric vehicles. At first they will confine their attention to wagons for park service, and delivery wagons, of which they hope to build as many as forty the coming winter. They do not think there is an immediate field for electric pleasure carriages on account of the lack of suitable supply stations.

Henry G. Morris, of this firm, makes the following statement in regard to the type of battery which they will employ, and their system of introducing their vehicles:

"Up to the present time we have only used two different styles of types of battery, and it is our purpose to adhere in the future, if possible, to one single type irrespective of the size of the vehicle or the character of work required, and we will obtain the different requirements for varied service by changing the number of cells used on the vehicle, and by various methods of grouping the same through the controller. The type that we have fixed upon is a fifty ampere hour cell, weighing about 13 lbs. complete. Twelve of these cells are grouped together in a single box or tray with brass plates on the sides for automatic contacts. These boxes or trays of batteries represent at the maximum rate of discharge exactly one kilo watt hour or one and one-third H. P. hours, and as they only weigh about 160 lbs. each, they can readily be handled by two men, four such boxes or trays are sufficient to propel an ordinary delivery wagon, weighing 1,000 lbs., twenty-five or thirty miles.

"We believe that the most practical application to which these vehicles can be put at the present time is for service in parks and delivery wagons. We do not consider it practicable, at the present time, to send out such vehicles broad-cast over the country before any proper arrangements have been made for their intelligent care and maintenance. We think that the proper plan for their introduction, is to construct a sufficient number of vehicles of one kind as to warrant the building of a charging station where the batteries can be charged, and the vehicles kept when not in use. This will enable a systematic and intelligent inspection of the various parts of the machines, such as all mechanical contrivances require, and will prevent all the troubles that would naturally arise from inexperienced persons handling and operating the same.

"The various parts of the machines can at first be purchased and then assembled at the station. This will permit of securing the best talent in the several lines of industry which go to make up a complete machine. The carriage builders' will build the bodies, the electrical manufacturing company the motors, and so on through the list. A building in a suitable central locality can be purchased or leased and the vehicles can be operated either on a lease or rental plan very similar to the manner in which a livery stable is at present conducted, thus assuring to the owners or lessees a complete and reliable service, such as they could not secure at first by attempting to operate the vehicle themselves. After becoming sufficiently familiar with their operation and the cost of conducting the same, the lessees will then be justified in making their own personal arrangements.



ELECTRIC BUGGY. MORRIS & SALOM, PHILADELPHIA, PA.

"The station would be equipped with dynamos for charging the batteries, and with a sufficient amount of machinery to make all necessary repairs and renewals of motors and batteries. Of course after 50 or 100 of these vehicles get into actual daily use, their introduction, we believe, will be as rapid, and the growth of the business as marvelous as that of the bicycle.

"While we have made no close estimates as to the cost of manufacturing in quantity, we believe that ordinary delivery wagons can be constructed for from $600 to $800, and pleasure carriages from $1,200 to $1,500, and for larger vehicles or special designs the prices will vary as much as they do in the ordinary carriage business at the present time.

"The magnitude of the business, and the possibilities which it may assume in the future can best be considered by comparing the work that is now done with horses, and that which could be accomplished by motor vehicles. At the present time there are probably no less than 100,000 horses in Philadelphia. It costs to keep these horses on an average, including feeding, shoeing, harness and depreciation or life of the horses, not less than $1 per day, or, in round numbers, about $30,000,000 a year. The work they do could be accomplished by motor vehicles at an expense not to exceed fifty cents a day, or about $15,000,000 a year, thus making a net saving in this one city alone of $15,000,000 per annum. Such a statement as this settles forever the question of good roads or good streets, as it is not contended that motor vehicles would be eminently successful under conditions that can scarcely be tolerated with animal traction at the present time. No further argument would be necessary for the rapid and permanent improvement of all streets and roads in the country, as the enormous saving that would be effected by the introduction of motor vehicles would repay the tax-payer ten fold in a few years. They would not only want good roads but perfect roads, and each city would vie with its neighbor in getting the most perfect pavements that could be laid. Ideal pavements for a city being a heavy bed of solid cement from curb to curb, and as nothing but rubber tires would be used, and as the wear and tear upon the pavements would be practically nothing, it would pay every city in the Union to effect a loan to build colossal sub-ways capable of taking care of all the underground work, so necessary and essential in large cities, and make a permanent pavement above."

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Paris Race Set for Next June.

The *New York Herald* of January 15th, reprints the following from its European edition of January 14th:

"The special committee having in charge the arrangement for the horseless carriage race in France, met to-day at 27 Quay d'Orsay, and decided that the race should take place in June next, the course selected being from Paris to Marseilles and return.

Among the conditions laid down is one that the contestants are to proceed only during the day-time. The race is to be divided into two series, the first open to automobiles of from two to four places, and the second series for machines having greater accommodation.

At the conclusion of the meeting the committee of the Automobile Club de France, Baron von Zuylen de Nyevelt in the chair, and between thirty and forty members present, it was decided to secure a villa in the Bois de Bologne as a branch of the Automobile Club during the summer. The villa will be called the Villa de l'ete."

Pays a Hundred Times Over.

American Motor Co., 116 Havemeyer Building.
New York, Jan. 9, 1896.

Editor "HORSELESS AGE," 157 William St., City.

Dear Sir :—We wish you would renew our advertisement in your paper for the year 1896, and take pleasure in stating at this opportunity, that the advertisement for the few months that we have advertised in the first numbers of your paper, have proven extremely valuable to us. We continue to receive inquiries from all parts of the country, and out of the country, many of which are from parties with whom we have already entered into business relations.

We feel confident that our advertisement for this year in your paper will pay for itself hundreds of times over, and we wish you all the success that we think you surely deserve.

Yours truly, AMERICAN MOTOR CO.

Designs for Electric Vehicles—The Problem from an Engineering Point of View.

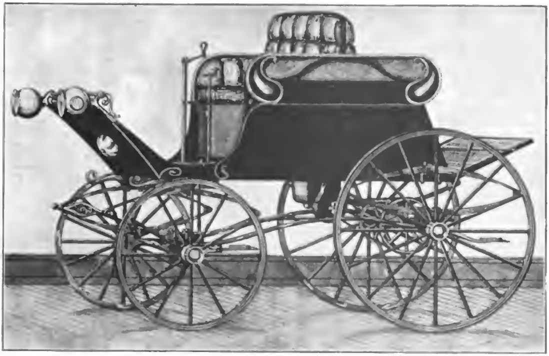
The C. E. Woods Company, the well known electrical engineers of Chicago, and New York, have spent a large amount of time and money investigating the motor vehicle question purely from a practical and engineering point of view. They think the result of their work has been rather startling in its phases inasmuch as it has shown many misconceptions concerning the matter, as well as many visionary projects.

Before an equipment of any kind can be satisfactorily devised or designed as a commercial product it is absolutely necessary to make a study of the conditions to be met in operation as they now exist, and to provide an equipment which shall successfully meet these conditions.

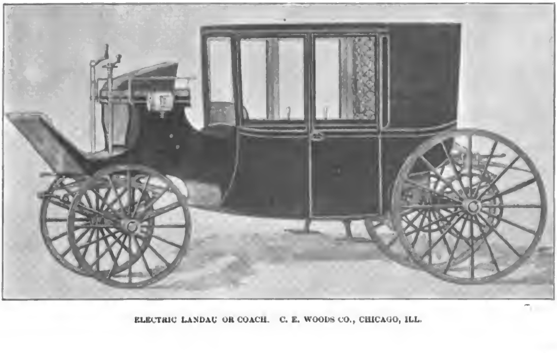
The first effort of this Company was to ascertain these conditions by pursuing a vigorous inquiry amongst cab and hack drivers, delivery wagon drivers, livery stables, etc, to learn the specific conditions of the different classes of vehicles on which mechanical power might be applied. This inquiry resulted in ascertaining that the average run of the cab, or public brougham, sometimes called coupe, does not exceed twenty-five miles a day; hacks do not exceed in the average over twenty miles a day; team rentals for liveries do not exceed an average of over four hours per rental, which would not average over twenty-five miles a run; while light delivery wagons do not exceed forty miles a day in their operation. There are, of course, some limited exceptions to these conditions, but several hundred inquiries resulted in these data, from which the Woods Company infer that it is hardly necessary, from a practical and commercial point of view, to equip a vehicle for a continuous run of from ten to fourteen hours, or a mileage capacity of one hundred or more miles, as is talked by the majority of the advocates of motor vehicles. Except in such vehicles as it might be desired to run on long stretches across the country, the equipment would be a useless amount of weight to carry around for no advantage except in a special emergency. Public conveyances and delivery wagons used constantly on the crowded streets of a city can under no circumstances expect to use a speed greater than five or six miles per hour, and vehicles for pleasure will probably be limited to twelve or fourteen miles on streets where they may be used.

Careful inquiry into public sentiment and conditions convinced the Woods Company that the first demand for motor vehicles is for light delivery wagons; then for public conveyances; then for liveries where the carriages can be rented by the public at large, and probably, after an accumulation of experience in these directions, heavy trucks will be considered. These latter they think are especially adapted to this class of work, as a careful inquiry shows that a day's operation does not mean more than about five hours actual run, the rest of the time being spent in receiving and discharging their loads at warehouses, depots, etc It must also be remembered that the speed of this class of work is extremely low, rarely exceeding three or four miles an hour, and in designing an equipment for such vehicles all these points must be taken into consideration.

The most interesting point at present to the manufacturer, and to the public in general, is what is to be the motive power which will be most successful as a whole when applied to the propulsion of the mechanical vehicle. A great deal has been, and is still looked for from electricity, but up to the present moment it has given some disappointment owing to the mistake of trying to get an equipment which is not designed for the



ELECTRIC DOS-A-DOS. C. E. WOODS CO., CHICAGO, ILL.



ELECTRIC LANDAU OR COACH. C. E. WOODS CO., CHICAGO, ILL.

purpose, or to meet the conditions, attached to some ordinary vehicle. In most instances according to the Woods Company, the work has been done on electric vehicles by, what would be termed, amateur electricians and not by the most skilled and learned men in the business, for the rapid and pressing changes in lines already employing them have absorbed their time in other directions. While, on the other hand, it is noticeable that as regards petroleum and kindred motors, the best engineering talent in that science has applied its energies for results. The electrical condition was special in street railway work and special equipment and construction had to be designed to meet the requirements, the same thing exists in electrical vehicles,—specially designed apparatus and details must be perfected to meet them, as the ordinary electrical apparatus which can be bought in the open market, and which has invariably been used, is not equal to the requirements of the case.

In making comparative differences between gasolene and petroleum motors and electrical equipment as to weight, notwithstanding some talk to the contrary, the Woods Company asserts that the former do not weigh twenty-five per cent. less, in toto, than good storage batteries, nor do they take up so much less room in the vehicle. The disadvantages of the petroleum motors in their opinion are:

First.—The disagreeable odors which accompany them.

Second.—The noise they make in operation, both mechanically and by their exhausts.

Third.—The amount of heat which they must necessarily contain and carry with the vehicle.

Fourth.—The fallibility of ignitors, and last, but not by any means least, the constant presence in the vehicle of combustibles, no matter how well surrounded by safeguards.

The advantages they sum up as follows:—Some lighter weight; a much greater mileage capacity with one charging; accessibility to fuel at most any point, and lesser cost in operation. The comparative difference according to their figures, is as follows:—Mileage capacity in petroleum and gas equipment, 100; mileage capacity in electric storage battery equipment, 60; cost per hour for running gas and petroleum vehicles about 25 per cent. less than for electrical equipments. These figures are not for any particular vehicle, but are comparative to equipment of the same power in any form.

In an electrical equipment they compute the weight at 800 pounds as compared to 500 and 550 pounds for gas and petroleum equipment, but in the electrical equipment there will be no noise, no heat, no presence of combustibles, fewer mechanical complications, more instantaneous control, and no reciprocating motion. Equipment for equipment, mileage for mileage, everything seems to them to be in favor of electricity, except one thing, the want of access to fuel renewal in anything like the ratio the others have, but the establishment of electric liveries and supply stations in large cities will overcome all these objections, and there is no question in their minds that this will be done.

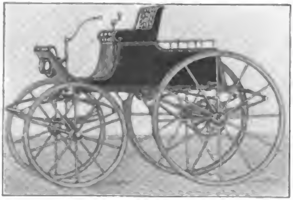
For country travel, and general roughing it over long distances, the gas and petroleum equipment will have their advantage, and possibly for heavy trucking, and in drawing a summary they conclude that both forms of construction have their field of utility, and both will find it, but eventually the electrical motor carriage is bound to predominate in all of the larger cities where current can be obtained, as those who manufacture current for public use will adopt a means of supply simultaneously with the demand for it.

In the vehicles as worked out by the C. E. Woods Company, the entire construction of the electrical equipment is said to have been designed with the same care and study that would be given to a high class electrical railroad proposition: the motor being a special apparatus, entirely different from anything that can be purchased in the open market. Special windings and design permit double the normal power to be used, under certain combinations, for starting torque and for climbing grades. Great study has also been given to the design of the controlling devices which will protect the electric equipment in ignorant hands, and also be positive in their operation.

The Company's method of procedure has been to first design an equipment that would meet the specific condition of each vehicle; then as artistic a design as possible in the form of body that would receive the equipment.

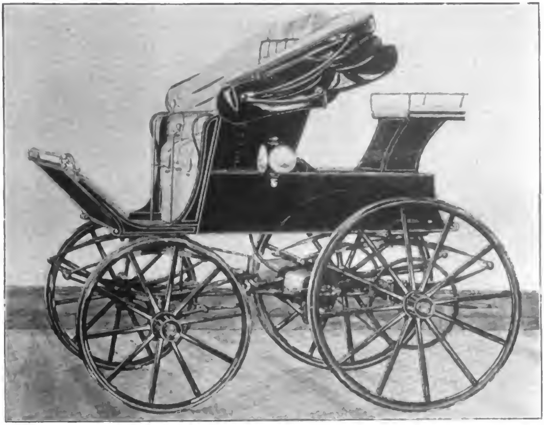
ELECTRIC BROUGHAM.

In the brougham and landau, as illustrated, there is surprisingly little difference in contour from those of the ordinary vehicles which we see on the street every day, yet the brougham is said to be fitted with 24 cells of storage battery, weighing 28 pounds each, and two, 900 Watt motors, weighing 75 pounds each; which is equivalent to a little over 2½ H. P., the batteries being of sufficent capacity to give a continuous normal power of 2½ H. P. for five consecutive hours.

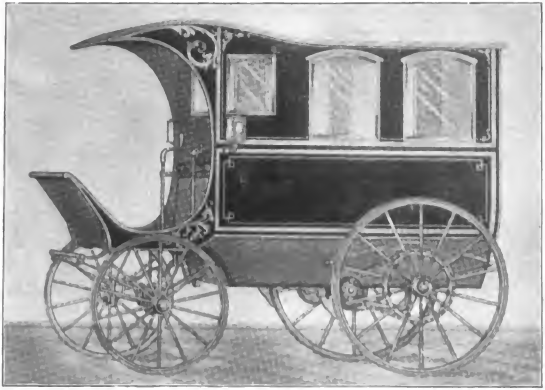


ELECTRIC TRAP.

The landau supposed to be equipped with 32 cells of battery, weighing 28 pounds each, and two, 1200 Watt motors, making a normal power of 3½ H. P. capacity for five hours continuous run. The trap is fitted with 20 cells, weighing 22 pounds each, and one, 1500 Watt motor, equal to 2 H. P. This has a capacity



ELECTRIC DEMI MAIL PHAETON. C. E. WOODS CO., CHICAGO, ILL.



ELECTRIC DELIVERY WAGON. C. E. WOODS CO., CHICAGO, ILL.

of five hours continuous run. The top carriage is fitted with the same equipment as the brougham, while the light delivery wagon is intended to have the same equipment as the landau. The light buggy has a 1200 Watt motor, about 1¾ H. P., and 16 cells of battery, with a normal discharge rate for five consecutive hours.

In the top carriage the controlling device and steering arrangements are so designed as to operate the vehicle either from the footman's seat, or the main seat. In the trap and light buggy but one motor is used, the rear axle turning, on which is fastened a strap brake if desired, while in the other and heavier vehicles using two motors, one motor is independent on either hind wheel.

This application of two motors the designers think desirable in public and street vehicles for large cities as they will form their own mutual adjustments in difference of speed between the two wheels in turning corners and other gyrations through the streets. The larger of these vehicles have an adjustment to five different speeds without the use of any rheostat whatever, and are so arranged that it is impossible to put on the brake without first cutting off the current from the motor; the act of putting on the brake doing this before the shoes form their grip on the wheel.

The weight of the 1500 Watt motor they give as 120 pounds; the 1200 Watt motor, 100 pounds; 900 Watt motor, 75 to 80 pounds. A vehicle equipped with a normal 2½ H. P. effort for five consecutive hours has in reality a much longer run than that time, for if on a level road the horizontal effort given by a 2½ H. P. equipment will produce a speed of twelve or fourteen miles per hour, a lesser speed of, say five or six hours would give nearly a pro rata difference in length of time for operation, but not, however, in mileage capacity.

Regarding the cost of batteries they say they can be bought now for about 25 cents per pound weight, and the cost to manufacture a motor for three different sizes they put at $45.00, $55.00 and $65.00, respectively. The controlling devices end miscellaneous details for a wagon will probably cost about $30.00 to $35.00 to manufacture.

This whole equipment is designed for use of storage batteries as they can now be bought in the market, and any improvement in these batteries, either in weight or capacity, will go to enhance the value of the equipment. The Woods Company have already had a battery brought to them for inspection which weighs but a trifle more than half as much as batteries heretofore used, and at the same time gives a larger discharge rate and as the demand increases for batteries for traction purposes they have little doubt that battery manufacturers will make every effort to fulfill the conditions desired.

Counted by the Hundreds.

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Editor "HORSELESS AGE," Charles City, Iowa.

Dear Sir:—I am in receipt of your letter asking whether I have heard from readers of THE HORSELESS AGE. In answer, would say yes. I have hundreds of letters from parties asking prices, description, and wanting agencies with exclusive territory. All state that they had seen the description of my motor carriage in THE HORSELESS AGE.

This demonstrates that the world is anxiously waiting for the right kind of a vehicle. I am surprised at the interest manifested by the public in general in the motor carriage. It is evident that here is a field of industry awaiting the inventive geniuses of the world. Yours respectfully.

M. H. DALEY.

TIMES-HERALD CONTEST.

Through Snow and Slush Contestants Struggle on—A Severe Test and a Signal Triumph.

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Notwithstanding that Chicago had been visited by a severe snow-storm the day before the date set for the motor vehicle contest, and the snow and slush lay from six to eight inches deep over the course, the judges were true to their word and ordered the contestants to the starting point at Midway Plaisance and Jackson Park.

On the previous evening eleven inventors had signified their intention of engaging in the race, but at 9 o'clock the next morning only six wagons had put in an appearance. The others being deterred by the terrible condition of the roads, or by the incompleteness of their machines.

The wagons which appeared at the starting point were: The electrobat of Morris & Salom; the gasolene wagon of the Duryea Motor Wagon Co.; the Benz wagon of the H. Mueller Manufacturing Co., Decatur, Ill.; the Benz wagon of the De La Vergne Refrigerating Machine Co.; the Roger wagon, owned by R. H. Macy & Co., and the electric wagon of Harold Sturges.

Morris and Salom were unable to make arrangements for supply stations over the entire length of the course, and announced that they would simply make a short run to show that the electric wagon could make satisfactory headway through deep snow. They made the run to Lincoln Park and part of the way back, when their supply of batteries gave out and they were compelled to stop. Henry G. Morris conducted and Hiram Percy Maxim acted as umpire.

The Duryeas came to the scene of the race, and returned after the finish by their own power. They were unable to complete the new and improved wagons on which they have been engaged for about two months, and were obliged to enter the old experimental wagon, which was built two years ago, has been run several thousand miles over ordinary roads, and was forced into the ditch with such disastrous consequences during the Consolation Race, November 2nd. The Duryea company were aware of its weakness, and scarcely dared hope that it would carry them over the course. But it did, and brought them first to the winning post.

At 8.55 the judges gave the word to the Duryeas, and the wagon passed out through the crowd at a lively pace. The occupants being J. Frank Duryea, and Arthur W. White, the umpire appointed for the vehicle.

Shortly afterward the Benz wagon of the De La Vergne Co. was sent off under the guidance of Frederick C. Haas, and with James F. Bate as umpire, but the wheels slipped in the deep snow, and Mr. Haas decided to withdraw from the competition.

The Macy wagon started at 8.59 with J. O'Connor as operator and Lieutenant Samuel Rodman, Jr., as umpire. The deep snow of the Midway Plaisance proved too much for this wagon as it had for the Benz wagon, and it had to be assisted over the bad spot by Mr. O'Connor.

The Sturges electric wagon started at 9.01, carrying Harold Sturges, the owner, and T. T. Bennett, the umpire, but the Mueller wagon owing to a delay in reaching the starting point, did not get off until six minutes past ten. Oscar Mueller conducted, and Charles B. King acted as umpire.

The speed of the wagons varied according to the condition of the roads. Where snow was deep or slush was plenty they toiled through the mess as best they could, but on certain stretches, conditions were more favorable for speed, and some lively sprinting was witnessed by the thousands of spectators who lined the way, and cheered heartily as each contestant passed.

As this was the first opportunity motor wagon inventors had had of testing the operation of the rubber tire in snow, some misgivings were felt, and an odd device was resorted to to prevent slipping. The tires of the Mueller and Duryea wagons were wound with twine under the impression that this would give a firmer grip on the snow. The occupants of the Duryea wagon soon dispensed with this make shift as it appeared to them unnecessary. One of the occupants of the Mueller wagon also busied himself in sanding the belt from time to time to prevent its slipping.

H. H KOHLSAAT, PROPRIETOR "TIMES HERALD

The Sturges wagon reached Lincoln Park at 12.15, and soon afterward abandoned the race, the deep snow of the Midway having proved so great a tax upon its motor that the conductor had to make frequent stops to keep it from burning out.

The Duryea wagon led from the beginning of the race, but the steering apparatus broke, necessitating a delay during which the Macy wagon passed the competitor. The Macy wagon led until Evanston was reached, where the Duryea again took the lead. The trip of the Macy machine was spiced with adventure. The vehicle collided with a street car in the city, and not very long afterwards it disputed the way with a heavy coach, and came out of the encounter with a broken steering gear and other infirmities, which speedily became chronic, and brought the machine to a stand-still finally at 6.15 P. M., twenty-five minutes behind the Duryea.

The Duryea machine arrived at the finish at 7.18, ten hours and twenty-eight minutes from the time of starting. Taking into account the delays for repairs, etc., the Duryea wagon made an average of about 7½ miles an hour, the actual time the vehicle was in motion being 7½ hours. Some time was also lost by losing the course at Lawrence Avenue on the return.

The Awards.

The judges after several days consultation made the following awards:

An award of $2,000 to the Duryea Motor Wagon Co., of Springfield, Mass., for best performance in the road race, for range of speed and pull, with compactness of design.

An award of $1,500 to the H. Mueller & Co. motocycle, of Decatur, Ill., for performance in the road race and economy in operation.

An award of $500 to the R. H. Macy & Co. motocycle, of New York, for showing made in the road race.

An award of $500 to the Sturges electric motocycle, of Chicago, for showing made in the road race.

An award of the *Times-Herald* gold medal to the Morris & Salom electrobat, of Philadelphia, for best showing made in the official tests, for safety, ease of control, absence of noise, vibration, heat or odor, cleanliness and general excellence of design and workmanship.

The following special awards were made by the committee on tests for meritorious points in design:

An award of $200 to the G. W. Lewis motocycle, of Chicago, for friction-driving device and brake, and a reduction gear for increasing speed.

An award of $150 to the Haynes & Appeson gasolene motocycle, of Kokomo, Ind., for plan of preventing vibration by balance of driving engines.

An award of $100 to the Max Hertel gasolene motocycle, of Chicago, for a device for starting the motor from the operator's seat in the vehicle.

An award of $50 to the De la Vergne Refrigerating Machine Co. of New York, for counterbalance on engine.

There were present as judges and associates, Professor John P. Barrett, city electrician; Leland L. Summers, editor of *Electrical Engineering*; C. P. Kimball, the well-known carriage manufacturer; Colonel Marshall I. Ludington, of the United States army; J. Allen Hornsby, secretary of the board of judges. Major-General Wesley Merritt was represented by Colonel Ludington, and Henry Tinken, of St. Louis, by Mr. Kimball.

On November 29th, Morris & Salom, manufacturers of the "electrobat," wrote a lengthy letter to the judges of the *Times-Herald* Race, in which they claimed the following points of superiority in their vehicles:

1st.—Absolute safety.
2nd—No noise.
3rd.—No vibration.
4th.—No heat.
5th.—No odor.
6th.—Simplicity of construction.
7th.—Ease of handling.
8th.—Perfect control.
9th.—Cleanliness.
10th.—Economy of power.
11th.—Economy of operation.
12th.—Cost.
13th.—Elegance of design, and freedom from mechanical appearance.

These points they took up and argued separately, contending that they were entitled to the award.

Chas. E. Duryea's Story of the Race.

Our wagon had been loaded into the car at Springfield, Mass., in a big hurry and in a big rain. Consequently some things were jammed and everything rusted. It had reached Chicago late on Wednesday and the car got lost in the flood of Thanksgiving stuff in the railroad yards, and could hardly be got at for unloading purposes. At last we got it up to the platform and unloaded. It was too cold to look the thing over on the platform, so we started the motor and moved over to a nearby carriage repository. Here we saw that everything was in running shape and as it was already late, we hurried up to the testing room. Here we expected to clean the wagon up but we were soon put on the testing machine and had no opportunity to do so. We were kept on the rack without supper till after midnight, and when we turned in at one o'clock, with orders to be called at six, we were almost too tired to sleep. Six o'clock found us up before the call reached us, and after forcing ourselves to swallow a little something in the way of breakfast, we reached the testing room a little after seven o'clock. We filled up with gasolene and started for the start, all the other wagons having already gone. A pleasant half hour's run down the Cottage Grove car tracks brought us to the famous Midway. In making several turns we noticed that the left wheel and the steering lever did not seem to synchronize, but an examination failed to show any way of correcting the trouble in the time yet ours before the start. So we simply trusted to luck and tried to forget that our steering was not all right. As we turned down the Midway, a kind spectator informed us: "One is just ahead of you there. It has been stuck in the snow for the last twenty minutes." We looked and saw a Benz wagon crossing the Midway, evidently hunting for an easier street to get to the start on. Our wheels kept turning and seemed to slip very little so we kept on through the Midway, thinking that if we could not get over to the start, we could not get back over it after the start, and a few minutes later we drew up at the starting point, being the first to arrive except one that had been hauled there on a dray. Shortly after eight we turned our wagon around and got it in position for the start, and at 8.55, our wagon in the charge of the inventor's brother, J. Frank Duryea, with Arthur W. White as umpire, was started. It was soon lost to view behind the crowd near the Illinois Central tracks, and our interest centered in the De la Vergne wagon, of Benz model, started one minute later. Scarcely had it got beyond the crowd at the tracks until a commotion there indicated something of interest and we started down that way. Before reaching the scene, the Macy wagon, also of Benz model, passed us and we met the Muller, a Benz with some changes, being hauled by a team to the starting point. When we got to the scene of interest, we found a dense crowd and asked the first one handy: "What is the matter?" "All stuck in the snow except the first one," was the answer, and going further we found a good natured crowd with their shoulders to the helpless wagons, shoving them along to the slogan: "It is a good thing; push it along." By this time the two electric wagons had arrived and found themselves in like difficulty. While the heavier one was pushed slowly along by the crowd, the driver of the other said: "It's against the rules to receive outside help, but" (*sotto voce*) "I guess you had better push us." At this the crowd laid hold, and the sight of four motor vehicles propelled by man power saddened the enthusiasts but tickled the cynics. We did not wait to see whether the sixth wagon fared any better, (for it did not start for over an hour and rumor says it also had to be pushed) but caught a train far down town where a light sleigh and a splendid team of horses were awaiting us.

CHARLES E. DURYEA.

On the train we speculated as to how many would get through and what time they would make. The writer felt that our wagon could be depended to hold the four mile speed in the worst places, and the intermediate speed in anything like decent going, and as the other wagons had but two changes of speed to our three we could gain on them in spite of themselves. "Barring accidents, we will win," was an axiom rather than a boast for we had faith in our motor, our gears and our steering. We expected our wagon to reach Van Buren Street in about an hour and a quarter, and were both surprised and pleased to see it roll into sight in a little less than one hour from the start.

The waiting crowd cheered and we swung our hats as it passed us. We then fell in behind it and let our horses move themselves to keep up. Around the corner and up on the Rush Street Bridge it went without any slacking of speed, where some of our followers got stalled. It was gradually gaining on us as it speeded over the rough but fairly snow free street when—Horrors! See that left steering wheel refusing to answer! The wagon stopped. We drove up and investigated.

Our luck had proved untrustworthy. Either in the accident of November second or in shipment, this portion of the steering had been strained and unable to hold out longer, here it gave way. While no more serious than some of the breaks that occurred to sleighs later in the day, it seemed serious because of the fact that we were in a contest and every minute allowed the other fellow to come closer. With a monkey wrench the broken part was removed and the operator started to look up a shop where some tools could be had, for we did not have a machine shop with us. The rules forbid outside help but did not forbid borrowing facilities. Being a holiday the shops were closed and it took a deal of looking to find any open, but finally one was found and the damage repaired in short order, not perfectly, but sufficiently good to get along with. Fifty-five minutes after the stop, the wagon was off again with a steering that steered, even if it was not perfect. In the meantime the Macy wagon had passed us and gotten thirty-five minutes ahead while a third wagon had rolled into sight several blocks back.

As we got into the deep snow of Lincoln Park our horses gained on the wagon and we followed it without difficulty. Here the faulty steering was quite apparent and the wagon could not make the speed it otherwise would have made. Still it kept up a good gait and we believed we were gaining on the wagon ahead. We occasionally hailed an interested spectator and from him learned how many minutes ahead the first wagon was. It soon became plainly evident that we were gaining, and after passing Lawrence Street we felt that our horses must be rested, so we watched the wagon disappear to the north while we turned over to the west in search of a hostelry on Clark Street where man and beast could be fed. We estimated that it would be 1.25 P. M. before the wagon reached the second relay and it was a question as to whether it would lead or be led at that time. Some wild hurras arose when at 1.10 it came in sight and drew up where we were waiting, with a clear road for at least a mile behind and nobody ahead. A look over the motor, some cool water in the place of the warm, an assurance that there was fuel sufficient and a bite to eat for the operator and umpire took about ten minutes, and again it was off down Clark Street at a speed too fast for our horses which were ready but unable to follow. About a mile down, Ashland Avenue leaves Clark Street and leads due south while Clark bears off to the east and Lincoln Park. We turned off Clark Street in the hopes of getting better going, expecting to see the wagon ahead of us on Ashland. It was not there nor had anybody seen it. We drove over towards Clark and inquired, and then back toward Ashland. Still no wagon. Again over to Clark and by merest luck found a man who had seen it going down Clark near Diversay. Others confirmed this report and we started that way. At Diversay we found the Sturges wagon waiting for a new supply of batteries, having used up power enough to have driven it sixty miles on decent roads and only covered about a dozen miles. We inquired of Mr. S——, and he said our wagon had come down there by mistake and had turned over on Diversay Street as being the nearest way back to the course. We saw a crowd far down the street and went that way. In the meantime the wagon had gone down Clark Street to Lawrence where it should have turned over to Ashland, and there the operator and umpire had discussed the matter and concluded that there was no turn there, for there was no sign in sight to indicate a corner. So they had followed Clark Street, and not till they had found themselves more than a mile to the east of and away from the course, did they realize that they were lost and had lost more than two miles of distance even by the shortest possible route back to the course. They had also lost in the character of the road, for while Ashland had been scraped by snowplows, Diversay was almost unbroken and this made a loss of time that would not have been recorded if they had not lost the course. To add to the ill luck, one of the electric fixtures gave trouble, and when we caught up to them the umpire was guarding the wagon while the operator was fanning a pile of charcoal with a piece of tin in an attempt to heat the part sufficiently to bend it. This was finally done and the journey resumed, after nearly an hour's delay. A few minutes brought us to Belmont Avenue with our wagon a half mile ahead and some other wagon in sight behind. What wagon was it? It was not gaining on our team, and so our wagon was gaining on it. Inquiry brought out the fact that our wagon still led and we began to feel that unless some delay more serious than those already experienced should come in, we would win without barring accidents. At California Avenue we turned off the course and took a short cut for the course at Humboldt Park. This enabled us to get ahead of the wagon and saved our team several miles. We had scarcely gotten there when the wagon showed up and led the way to the south without stopping. The deep snow had scarcely been broken except by sleighs which packed a narrow roadway, but not hard enough for a wagon nor wide enough. As a result the wagon slewed from side to side as the wheels slipped off the packed portion or cut through it. Worse going for a wagon could hardly have been made out of ten inches of dense packed snow, and yet this is what the first wagon had to fight through the whole way down the west side. An army of sleighs and rigs followed and occasionally one would get in the front and in the way. There was much enthusiasm and many snowballs. We knew that the cavalcade were making a good road for the next fellow, but that did not worry us, for we believed we were going faster than he could anyhow. We passed Humboldt Park and turned west along a trackless waste of snow toward Garfield Park. Suddenly the machinery went "b-r-r-r-r." Our hats climbed upon our hair, probably to get a better view; the operator and umpire jumped out and the writer rushed up to see what was wrong. While the operator looked in at one side the writer looked in at the other and found a broken tooth in a gear-wheel. "The teeth are all off the driving gear" he shouted, and we felt that we were out of the contest.

Not so with the operator, however, and he proceeded to examine the gear. He found a chip flaked off one of the teeth and lodged in the space between the teeth, causing a jump at every revolution. This was quickly removed and all went forward as if nothing had happened. At the park, no sign could be seen and the wrong road was taken which led around a circle and back nearly to where it started. More lost distance. We then decided to try to keep the team ahead to hunt the way. In the deep snow where sleighing was better than wagoning and neither good, this could be done, and from there on we led the way. At the viaduct over the railroad at the south side of Garfield Park, a large crowd assembled to see the wagon refuse to climb. The writer walked where he could watch the driving wheels to see if the wheels slipped. On the steep grade with a wet icy surface they certainly would slip if they were likely to do so anywhere, but they did not. The wagon went up without any trouble or effort, and was the only one to do so without being pushed. By this time dark threatening clouds accompanying a warm south wind began to appear, and most of the cavalcade left us before reaching Douglas Park, through which we threaded our way almost alone. We here overtook a *Times-Herald* man, who had almost tired of waiting, and with him to lead the way kept on plowing our track toward the south. The warm wind made riding more pleasant than earlier in the day, but a drop of water occasionally suggested a shower, and the snow was still stiff.

Western Avenue Boulevard is ordinarily as fine a drive as one need wish for, but on that night it seemed some bit of original prairie, and not till we had nearly reached its southern end near 55th Street did we begin to notice that the snow had softened under the warm wind sufficiently to begin to act as slush and permit the wagon to cut through and roll on better surface. The speed visibly increased, and as we began to get into traveled portions of 55th Street it became necessary to urge our tired horses. A short stop to see that there was fuel sufficient, and a few short delays caused by passing trains was all that delayed us. A few words of cheer enlivened the lonesome places, while the shouts and exclamations of the outdoor populace made things merry where civilization was found. Down through Washington Park, and along the Midway to the start, we rolled at a speed almost too much for our tired teams, and at 7.18 the trip was completed. Congratulations all around. We had won the first road contest in America. We had proven the motor wagon to be superior to the horse on roads decidedly unfavorable to wheels. We had forever answered the objections of *ultra* conservative people to the effect that the motor wagon could not be of use except on good roads; we had opened a new era; we had set forth a new type of vehicle. No contest or trip over summer roads, or under pleasant skies could have demonstrated our claim for our vehicle as did this trip.

Our stops for all purposes amounted to nearly three hours, so that in less than seven and one-half hours we had covered more than fifty-six miles of pre-determined road, made very bad by one of the worst snow-storms known in the north-west. An average of seven and one-half miles per hour could not be maintained by the average horse over a good road for that distance, and over these roads it was simply impossible, but the wagon did it. Our team were exceptionally good roadsters, and had covered but about three-fifths of the total distance, and they were so tired it was cruel to urge them; they like the wagon had had a hard job, for the snow was stiffer and deeper and much harder to get through at any given point when we went through it, than it was an hour and one-half later when the second wagon came along. No cavalcade had broken our way, nor had a kindly sun or warm wind lessened its harshness. Cyclers and motor wagon people appreciate these things, but the average horse-driver does not; we felt them; we were too hungry and tired to say anything about them. The umpire was willing to try a sleigh ride, so the writer changed places with him, and the wagon was at once started toward the stables at 16th Street, which it had left twelve hours before. The writer offered to take the steering and rest the operator, but was met by the statement that there was no fatigue from that source, and that so far as muscular effort was concerned, the trip could be repeated at once. An uneventful run brought us to the stables, the last to leave them in the morning and the only one to make the trip and return at will the same night. We had covered fully seventy miles since leaving there in the morning, and our motor had made turns enough to have carried us three times that far on decent roads. We had power to spare at all places, and had no occasion to get out and push, and we were the only ones with this record. Our motor had not stopped in the last twenty miles, and when we pushed the button to stop it, there was no indication that it was not ready for the same work again. When the doors had closed behind it, we left it. There was no muddy unhitching, no cleaning, no feeding; it was our faithful servant. At our will it stopped, and at our will it would start again, and barring accidents it would do what we asked. The knowledge of this gave a pleasure not found connected with horses. We were born and brought up where horse flesh was plentiful, and the back of a horse was our second cradle. We know something about the horse; we have petted his mane gently and with a heart full of love and poetry only to be thrown over his head and walked on at a moment when we thought not. We have fed him bountifully and kindly only to be kicked against the other side of the barn as we left his stall. We have spent years educating him, and felt that he was a most docile and intelligent animal only to be thrown out of the buggy by sudden fright at a scrap of paper. Perhaps we did not think of these things as we hurried toward supper, but we were thankful our rig was not dependent on horse-flesh.

The next morning we were put on the testing machines without cleaning or attention of any sort. This was not good mechanical practice, nor was it conducive to a fine showing, but it was practical. It was what the motor wagon must expect to get. In that condition we managed to turn the wheels at a speed of 27 miles per hour and developed an actual 4-horse power.

When the tests were concluded we got in and drove to a carriage repository where we left the wagon to be crated for shipment to its home at Springfield, Mass. Its career of usefulness is probably ended. It was designed two years ago, and built as an experimental job usually is, in a cut and try manner. Changes and modifications have been made in it until it is a patched job throughout, and we do not care to damage our machines of later and better design by putting this one out as a sample of our work, although it has never had need for horse muscle so long as its own wheels were unbroken, and it has met and more than matched the best devices yet shown in its line. Had we been able to submit one of our later wagons now nearly complete, our victory would have been greater, but our joy would have been less.

There will be other contests but none will ever attract the attention or produce the effect on public opinion that the first one produced.

Long live the motor wagon!

Chas. E. Duryea.

The Duryea Motor Wagon.

The Duryea motor employs gasolene as fuel. It has two parallel cylinders with pistons balanced 180° apart, and so arranged that one operates independently in case an accident happens to the other.

These cylinders are at right angles to the longitudinal axis of the wagon, and drive a main shaft running lengthwise of the wagon. On one end of this shaft is mounted a beveled gear and fly wheel. The beveled gear communicates motion to a shaft at right angles to the main one, on which are three friction clutches of different diameter, giving variable speeds of four, eight, twelve and sixteen miles an hour when brought into engagement.

The second shaft is connected to a driving shaft by means of spur gears, and on this driving shaft is a sprocket wheel, which in turn communicates the motion by a sprocket and chain to a wheel on the rear axle.

A "jack in the box," or epicycloidal gear, is employed to regulate the wheels in turning.

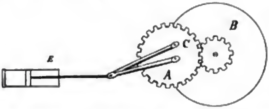
No carburetor is used, but simply one admission air valve.

In starting the motor, a few charges of gas are pumped into the mixing chamber by means of a hand pump, then a few turns of a crank at the end of the cross shaft, at the side of the wagon, sets the machinery in motion.

Max Hertel's Motor Carriage.

The motor carriage of Max Hertel attracted considerable notice at the testing room. It is of light bicycle build and weighs only about 250 pounds.

The motor develops 2-horse power and has two parallel cylinders, which act together upon a crank shaft of new design.



The pistons E drive the crank shaft centered at C, communicating motion to the driving wheel A, which in turn drives the second shaft B. On this shaft B is the fly wheel D, and on each end of the shaft is a friction pinion H, which engages the friction rim G, on the wheel F.

The shaft B is mounted on a universal joint so that the wheel H has some play forward and back, in order to engage the friction on the wheel F.

The vehicle can be started from the operator's seat by moving the lever A to C. The friction can be brought into engagement with H by moving A to B.

By revolving A higher or lower the admission of gas and air can be regulated.

The fly wheel weighs only 24 pounds, but the novel-gearing makes it equivalent to a fly wheel of over 300 pounds on the first shaft.

There is no arrangement for backing in this vehicle.

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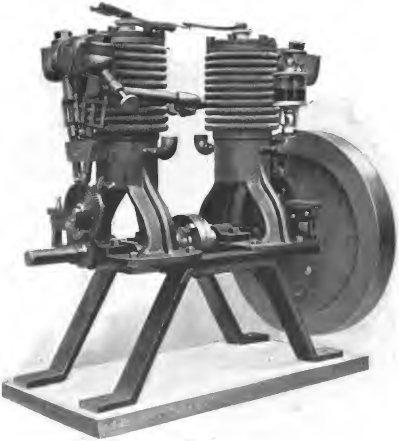
New "Twin" American Motor.

The American Motor Co., New York, inventors and manufacturers of the well-known American Motor, have just completed a double motor, which they call the "Twin."

This motor weighs about 80 pounds without the base, and develops from three to four horse power, according to the fuel used. Only one fly-wheel is needed, as both cylinders drive the same shaft.

The stroke is 4 by 3¼ inches. The cylinders are cooled by coils of soft metal, which encircle them and radiate the superfluous heat.

This motor is now being used for carriages and boats, and for various stationary purposes.



"TWIN" AMERICAN MOTOR. AMERICAN MOTOR CO., NEW YORK.

Straws that Show the Wind.

Barnum & Bailey's "Greatest Show on Earth" is to exhibit a Duryea motor wagon through the country next season.

James Fancher, an expressman doing business between Bridgeport and Westport, Conn., wants to substitute a motor wagon for his present equipment.

Dr. C. C. Booth, Youngstown, O., gave a public exhibition of his motor buggy in that city on November 27th. The test is said to have been very satisfactory.

A Cincinnati clothier tested a motor delivery wagon in that city just before Christmas. When certain minor changes are made in the details, he will put the wagon into regular service.

The National Capital Street Car Motor Co., Washington, D. C., are building a street car motor to run by gas compressed in tanks, and will be manufacturing motor wagons by March of this year.

It is reported that the Eclipse Bicycle Co., of Elmira, N. Y., will begin the manufacture of motor carriages in a few weeks and will also put on the market a line of the tricycle delivery wagons now so popular among city merchants.

The Electric Carriage and Wagon Co. has been incorporated at Philadelphia, with a capital stock of $10,000. The incorporators are: Victor H. Conkle, Maurice Barnett, G. Herbert Condick, Ralph Gibson and T. Fred. Sinnott, all of Philadelphia.

Geo. W. Miller & Co., wagon builders, of 1955 West Farms Road, New York City, have an order for a motor delivery wagon with prospects of further orders, and would like to correspond with manufacturers of motors and gears for transmitting power.

The *London Daily News* of November 30th, contained a leading editorial headed "The Horseless Age," in which reference was made to this journal, followed by a very fair and scholarly review of the general prospects of the motor vehicle from the lay standpoint.

The Buckeye Mfg Co., Anderson, Ind., manufacturers of the Lambert Gas Engines, have announced their intention of entering extensively into the production of motor vehicles with the beginning of the New Year. They expect to be ready to exhibit their vehicles early in the spring.

Rudolph Aronson, the New York theatrical manager, contemplates the erection in the metropolis of a mammoth building to be devoted to athletic purposes, and containing a mile race track. Among the various sports Mr. Aronson has in view are motor vehicle races. The track will be of asphalt.

A. J. De Neal, of Toledo, O., has invented a compressed air bicycle, with which a mile has been made in 1 minute 59 seconds. Its weight is about 35 pounds, and the pressure employed furnishes one horse power. It makes considerable noise, but the inventor hopes to overcome this objection.

C. L. Moses, of C. L. Moses & Co., Oil, Gas and Artesian Water Well Contractors, Welch, W. Va., has been studying the motor vehicle problem for the past thirteen years. He hopes soon to lay before the readers of the Horseless Age a vehicle of different design from any that has yet been illustrated in our columns.

George and A. W. White, representing Geo. White & Sons, London, Ont., were in Chicago attending the race on Thanksgiving day. They expect to go into the manufacture of motor vehicles and are in position to interest capital in that branch of industry. A. W. White was selected as one of the umpires in the above race.

Harry E. Dey, of the Dey-Griswold Co., 108 Fulton Street, New York, inventor of the Dey Electric system of propelling vehicles, is at work upon an entirely new gas motor, to be used for charging the batteries of his system at home or taken on long journeys. He states that his 2-horse motor will weigh about 20 pounds, and will run with any hydrocarbon oil or illuminating gas.

J. C. and Pat. Calhoun, two well known New York capitalists who are largely interested in the Euclid Heights property, a fine suburban allotment near Cleveland, O., are about to introduce a line of motor stages to run from the centre of the city to the suburban site. The vehicles, which will be six in number, will be of the Roger type, specially constructed for the purpose, and will carry from ten to fourteen persons each.

The Archibald Wheel Co., Lawrence, Mass., are much interested in the application of motors to omnibuses, trucks and fire apparatus, as they make about nine-tenths of the wheels used on fire engines, hook and ladder trucks and hose wagons, in the United States. Many years ago they made the wheels which were used on self-propelling steam fire engines in the city of New York. These engines proved too heavy to be practical, but with the appearance of a lighter and more economical power, the Archibald Company believes the problem of propelling fire engines and other heavy vehicles by power within themselves is very near a solution.

James A. Hockett, Sterling, Rice County, Kansas, has built a motor threshing machine, propelled and operated by a 16 horse power gasolene motor. This machine is built upon much the same plan as an ordinary steam threshing machine. The motor is under and between the large drive wheels, and motion is transmitted from a cog-wheel to the outside machinery by a chain and sprocket. It does not require as many hands to operate this machine successfully as a steam thresher does, and the great saving of fuel is another strong point in its favor. It has been thoroughly tested in practical operations this fall, and a company has been organized to put the "Hockett gasolene traction engine" upon the market.

J. B. West, of Rochester, N. Y., whose gasolene vehicle was illustrated and described in the first issue of The Horseless Age, started out with the idea of making the motor carriage problem a recreation, intending to build one for his own use only. But as he got deeper into the subject he became intensely interested and decided to carry out his ideas to the fullest possible extent. This resolution was strengthened by the large number of inquiries he received from the publication of the picture of his carriage in The Horseless Age and other mediums, inquiries which were not confined to this country alone. He now believes he has gotten rid of all disagreeable vibration, and will be able to dispense with the cooling apparatus. Many inquirers wish to buy the motors to put in boats, or to apply to vehicles of their own manufacture, while several local concerns wish to turn out the vehicles complete. With such a promising outlook Mr. West feels warranted in concluding that his vehicle and his motor will both be manufactured for the market in 1896.

Trade Notes.

The New Power Co. are said to have completed their carbonic acid motor, but decline to appear in print yet.

L. J. Wing & Co., 109 Liberty Street, New York, state that they will be ready to show a "Wing Work Wagon" to their many prospective customers about February 1st.

The Roger American Mechanical Carriage Co., New York, are engaged upon a new and improved carriage which they expect to place on exhibition in not less than ninety days.

The Daimler Motor Co., Steinway, L. I., have advices from their superintendent, Mr. Fred Knebler, now in Europe, that a consignment of improved Daimler carriages will arrive in New York about February 1st.

The Rogers Iron Works, Oakland, Me., was recently incorporated with a capital stock of $300,000 to manufacture a ball bearing for bicycles and carriages, which is claimed to be absolutely frictionless.

The Pope Mfg Co. are conducting experiments in their motor vehicle department, and expect to have some announcement to make in the spring. Both electric and petroleum motors are being carefully tested by them.

The Imperial Ball Bearing Co., of Chicago, have given the sole right to manufacture their axles in Canada to the Gananoque Spring Co., Gananoque, Ontario, who will hereafter have the exclusive sale of these goods in the Dominion.

The Clinton (Iowa) *Morning Age* of December 7th, states that a company is being organized there to manufacture the Pennington motor vehicles and motors for all light purposes. The site favored is on the banks of the Mississippi, where excellent wharf and railroad facilities are to be had.

One of Hildebrand & Wolfmuller's petroleum bicycles has been seen on the streets of New York many times within the past few weeks. It is the property of Harry Lamore, an English variety performer, who is playing an engagement at Hammerstein's Olympia. The bicycle weighs 200 pounds, and cost about $300.

The United Gas Company, 104 Wall Street, New York City, are introducing through the South and other sections where wood is plentiful, a new process controlled by them, of extracting gas from wood. The basic wood gas, enriched by carbons, is said to furnish an excellent illuminant, and to be equally desirable for heating and power purposes. It is specially recommended for gas engines.

Charles H. Barrows, Willimantic, Conn., is still improving his motor vehicle. He has sent a circular to his many prospective customers, asking their indulgence a little longer, and stating that when completed his vehicle will weigh about 300 pounds and have the same capacity as a 1-horse buggy. With one lever the operator starts, stops, turns and regulates speed up to a maximum of 20 miles an hour. By his recent improvements Mr. Barrows does away with chains, sprockets, cranks, clutches and gears, and yet claims to accomplish all that can be desired of a motor vehicle. For the present Mr. Barrows will use an oil motor, but hopes soon to be in a position to offer his customers their choice of oil or electricity as a motive agent.

Evolution Vapor Motor.

We herewith illustrate a two horse power, marine type, single cylinder motor, called by this appropriate name and soon to be placed on the market by the Evolution Motor Company, New Haven, Conn.

In this motor will be found several novel and original ideas, the most important of which are the methods employed for admitting and controlling the air and vapor to the base where they are mixed, and from there transferred by a unique device to the exploding cylinder, where they are electrically ignited at the proper time. This is accomplished without the use of a valve of any kind except the working piston of the motor, which performs the duties of all other appliances besides that of the regular working piston.

The most noticeable feature of this motor is its simplicity of construction. It is claimed to have fewer parts than any other vapor or gas motor, being minus all gears, frictions, cams and check valves, to reduce power and give annoyance.

The methods employed for lubricating the piston and wrist pin are unique and thoroughly reliable. This is accomplished by the use of a sight feed lubricator, made for this purpose, and attached to the top end of the valve casing.

This motor is very compact, its dimensions being: length of base, 6½ inches; width over flanges, 15 inches; height from center of crank shaft to top of cylinder, 15¼ inches; diameter of fly-wheel, 10¾ inches; weight of motor complete, about 200 lbs.

It has a water jacket cast with the cylinder. The electric igniter designed for and used with it may be called a repeater or multiplier, as it is so contructed that it may be regulated to give either one, two or three sparks in quick succession, as desired. This is a very important point, as poor gasolene is often encountered which is very difficult to ignite in the cylinder of a motor.

One more important feature, when used for marine purposes, is a reversing propeller wheel. By this appliance the motor is kept running in one direction, while the propeller is reversed at will. By this method the danger of colliding with docks or doing other damage is wholly avoided.

In construction it is of the vertical, enclosed crank-case type, symmetrical in design, compact and self-contained.

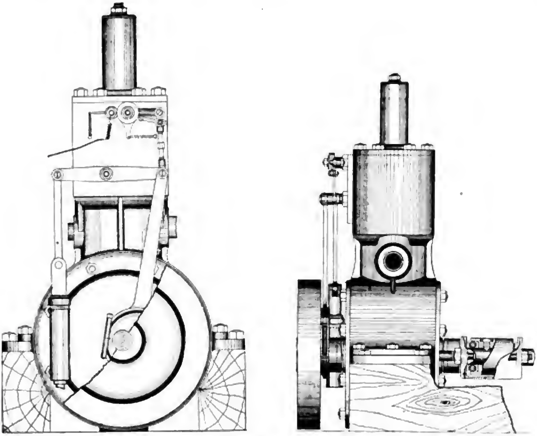
The main body is cast in two parts, bolted together on a line with the center of the crank shaft. The upper part contains the water jacket, explosion cylinder, working piston, igniter, etc.

The base contains the disks and crank shaft, which are perfectly balanced. The two ends, or flanges, are securely bolted to the frame, support the crank shaft, and form a reservoir for oil, into which the crank dips at every revolution, thus securing perfect lubrication of the crank shaft and connections.

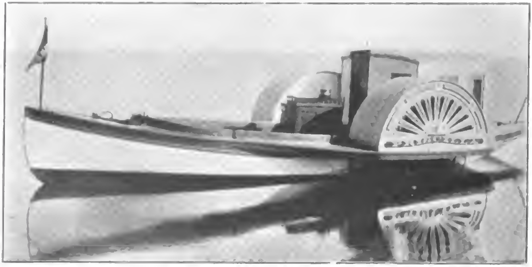
The fuel is gasolene, manufactured, or natural gas electrically exploded. This motor receives an impulse or explosion at every revolution in each cylinder, whether running light or loaded. The regulation is accomplished by varying the quantity and not the quality of the charge, the proportion of gas and air remaining always the same.

This motor will be built in sizes from 1 to 6 H. P. single cylinder, and from 2 to 12 in double cylinder. Attached to it, for marine purposes, is a ball-thrust bearing of unique design and compact form, which reduces the friction to a minimum.

A vehicle motor built on the same principles as the marine type, though modified to suit the requirements, will soon be brought out by this Company. A double motor will be used, and like the marine type it will be simple and compact. Many novel and original features will be introduced in its construction.



EVOLUTION VAPOR MOTOR. EVOLUTION MOTOR CO., NEW HAVEN, CONN.



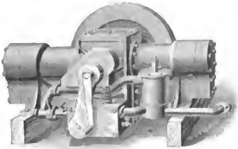
PADDLE WHEEL LAUNCH. DAIMLER MOTOR CO., STEINWAY, L. I.

The Hirsch Launch Motor.

Feodor Hirsch, of New York, is the inventor of a launch motor which possesses a number of distinct merits.

It is a double cylinder motor of perfectly balanced construction, so that vibration is entirely done away with. On account of the horizontal construction the motor sits very low in the boat, and is covered from view under the seats amidships, affording the full seating capacity of the boat. A 28-foot boat seats twenty-one persons comfortably.

The exhaust passes into the water under the stern, doing away with all noise and odor.



There are no oil cups, valves or gauges to watch to prevent overheating. One oil cup at the top of the motor automatically lubricates all the working parts, and as all the moving parts run in an oil bath, overheating is impossible.

The steersman in the bow has the boat under complete control. By moving a lever attached to the wheel, he can go ahead, stop or reverse, and by means of another lever conveniently placed at his right, he can increase or decrease speed at will.

The gasolene tank, placed in the bow, holds enough for a run of 600 miles, and the mean consumption of fuel is one pint per horse power per hour.

The maximum speed of a 28-foot launch is nine miles an hour.

The Hirsch motors are built in sizes from 2-horse power up to 12, and larger sizes are now being designed.

These motor boats are built for Mr. Hirsch at the works of the De La Vergne Refrigerating Machine Co., Port Morris, New York City.

* * *

Paddle-Wheel Daimler Launch.

The Daimler Motor Co., Steinway, L. I., are building for use in Florida waters, a paddle wheel motor launch, which draws only 16 inches amidships, and 21 inches aft. It is 30 feet in length, 15 feet wide over all, 30 inches deep, and has a half cabin aft, and a cockpit forward. Power is supplied by a 7-horse power Daimler marine motor, working on a new system of standing bed and V screws. The space occupied by the engine and driving-gear is only 3 feet 6 inches, leaving ample room on both sides, and the maximum speed is estimated at not less than 10 miles an hour.

The Daimler Co. are preparing to add two stories to their main building, and soon after the first of the year will double their present force. The new kerosene motor of which something has already been said, will be placed on the market about the 1st of February.

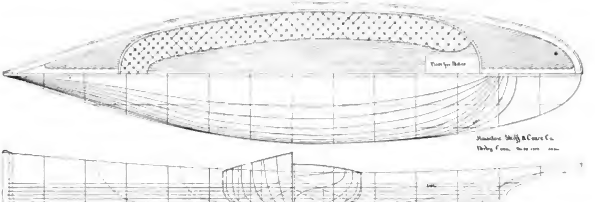
* * *

Will make a Specialty of Motor Boats.

The Housatonic Skiff and Canoe Co., Derby, Conn., are making preparations to supply the present demand for motor boats. They have perfected a model which they believe is specially adapted to motor use. The dimensions of this boat are, length 25 feet, beam 6 feet, and the draft is only 18 inches, unusually light for a boat of this size.

Another new feature is the cabin or awning which is removable, being held in place by nickel-plated rods, which are stepped into sockets fastened to the outside of the combing. Hence it interferes in no way with the back of the seats.

The Housatonic Co., have in press a special catalogue on motor boats, which they will mail interested parties. They furnish any motor desired by their patrons.

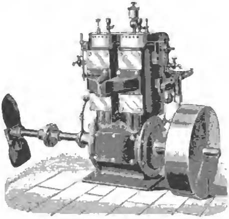


DESIGN OF MOTOR BOAT. HOUSATONIC SKIFF AND CANOE CO., DERBY, CONN.

The Sintz Kerosene Motor.

The Sintz Gas Engine Co., of Grand Rapids, Mich., have recently perfected a kerosene motor for boats, which is very compact, economical in fuel, and is capable of a speed of 600 to 800 revolutions.

The motor is made in one casting, so reducing the weight that the 4-horse power weighs less than 400 lbs., and the 16-horse power less than 1,400 lbs.



Two impulses are obtained with every revolution, producing regular and reliable power. The only parts in motion are the pistons, connecting rod, the crank attached to the propeller shaft, and a small pump worked from an eccentric and used to pump out bilge water, or pump in water to cool the cylinders.

No carburetor is used, but a generator which vaporizes each charge as it enters the motor, thus insuring like quality in the charges.

The explosion is produced by the motion of the eccentric working the pump.

A feature of this motor is the reversible wheel, which has two blades and can be made a right or left hand screw while the motor is running. It is operated by a reversible lever placed in a convenient position either fore or aft of the motor.

The advantage claimed for the double cylinder is that with double the power the same speed is developed as is obtained in the small single-cylinder motor.

No counterbalance is required in the wheel, as the cranks are set opposite, and one cylinder helps the other.

The fuel consumption is said to be one gallon per horse power for each day of ten hours.

A laughable incident is reported from the other side. Mr. Simms, manager of Daimler Motor Syndicate who owns a Daimler launch, left his moorings at a high rate of speed. At the same mooring was a gentleman occupying a Canadian canoe. The high speed of the motor boat caused a little commotion in the water, and the canoe and the supersensitive occupant were rocked unpleasantly. The owner of the canoe appealed to the courts, and in spite of protest, the owner of the motor boat was fined £5 and costs. Such is the reward ever meted out to the promoters of improvement.

MORE PRESS COMMENTS
—ON—
THE HORSELESS AGE.

The motocycle, or horseless vehicle, industry has become sufficiently important in this country to support a publication. The new journal is "The Horseless Age," and is published in New York.—*San Francisco Bulletin.*

"The Horseless Age" for December brings the latest news about motor vehicles. It is a bright, enterprising journal, and we are not surprised to learn that it is building up a large circulation. Published by E. P. Ingersoll, 157-159 William Street, New York.—*New Bedford Standard.*

New York has a new publication devoted to a new interest in vehicle trade. The Horseless Age, Vol. 1, No. 1, issued by E. P. Engersoll, 157-159 William Street, contains much that is new, novel, startling and suggestive in the motor vehicle industry. It is filled with illustrations and descriptive articles relative to horseless vehicles of all sorts. It may not fill a long-felt want, but certainly covers a new field of as yet somewhat speculative industry most admirably.—*Toledo Blade.*

A new journal called The Horseless Age has just appeared. It celebrates the new conveyances that are to scorn the aid of the horse. But this is not a horseless age yet, if we may judge by the demonstration at the Madison Square garden. Motor wagons and bicycles and trolleys and locomotives may come and go, but humanity will go on loving the horse and petting him when it ceases to abuse him with burdens. Indeed, when the horse has wholly ceased to be the drudge, if that time shall come, he will still be the companion and friend of mankind.—*Brooklyn Times.*

The first issue of "The Horseless Age," a monthly journal devoted to the interests of the motor vehicle industry, published by E. P. Ingersoll, 157 William Street, New York, has been received. The appearance of a journal devoted to a branch industry yet in an embryonic state may seem to be premature, and may provoke some surprise that such a publication should be necessary. But on examining the numerous devices presented in the initial volume, the surprise ceases, and the wonder is that it had not been started before. For sale by the publisher. Price $2 per year; single copies twenty-five cents.—*Baltimore American.*

"The Horseless Age" is the rather fascinating title of a new monthly devoted to the interests of the motor vehicle industry which is taking big strides now in this country and abroad, although it is yet in not much more than an embryonic state. The editor says in his "Salutatory": "All signs point to the motor vehicle as the necessary sequence of methods of locomotion already established and approved. The growing needs of our civilization demand it, the public demand it, and await with lively interest its practical application to the daily business of the world." The need in this condition of expectancy is news, and The Horseless Age promises to supply, in full measure, information as to the progress of this great mechanical movement. The number on the *Herald's* tables contains several illustrations of the motor carriage in its latest models. In the next issue will be printed a detailed account of the Chicago *Times-Herald* contest.—*Syracuse Herald.*

"The Horseless Age" is the latest addition to the journalistic specialties of the United States. The initial number of the new monthly is of promising appearance, containing 56 broad two-column pages. It is published "in the interest of the motor vehicle," and in spite of the recent practical introduction of the horseless carriage, seems to have no dearth of interesting material. The illustrations, which are well produced show that there is already no lack of variety in style, construction and motive principle, and that in road locomotion the Horseless Age is really at hand.—*Toronto Globe*.

About as good an example of "taking time by the forelock' (although perhaps we should say "by the steering wheel") as we have seen, is in the advent of The Horseless Age, a new monthly magazine of about 50 pages, 9¼ x11¼ inches. It is very neatly gotten up and is extremely interesting, containing, as it does, more motor-carriages than most of us knew were in existence. The problem of making motors light enough to be practical is one which will continue to attract wide attention, and the mechanic will find this journal interesting and instructive in this line. Although a few electrical carriages are shown, the oil and even steam engines appear to have the advantage It has our best wishes for a successful future.—*Machinery, New York*.

Evidently the editor of The Horseless Age is not one of the kind to wait for an evolution. He goes forth and brings it in. It was no doubt the same sort of nerve which prompted him to launch an expensive journal in the interest of an industry as yet in embryo, which now prompts him to correct the vagaries of the English language. This is his first attempt, but it does not bear any indications of timidity to lead one to expect he will stop there: "There seems to be no good reason why benzene and gasolene should be spelled with an i, in the termination, as they commonly are to-day, while acetylene and kerosene take the e. Hence the editor of The Horseless Age has decided hereafter to adopt the uniform phonetic spelling 'ene' for all these names of hydrocarbons —*Waterbury American*.

The establishing of a journal in New York called The Horseless Age is significant; inasmuch as it shows that the growth of ideas tending toward the use of electricty as a common motor for vehicles. The Horseless Age contains numerous advertisements of an astonishingly large number of vehicles already constructed, in which the poor patient horse will cut no figure.

Petroleum, gasolene and electricity have been adapted to the horseless vehicles, and, perhaps, during our own times we shall see one or all of these supplant other modes of propelling not only elegant equipages on the boulevards, but in general use for drayage purpose throughout the cities and country.

A craze for the horseless vehicles, such as that for the bicycle, seems to be upon us, and with its advent comes another factor in the depression of Kentucky's staple product, the horse. The faithful street-car mule has gradually been supplanted by the trolley until he is a drug on the market; will the horseless vehicle do the same for the horse?—*Louisville Post*.

The United States Odometer.

Bean & Lang, manufacturers of the United States Cyclometer, Fond du Lac, Wis., have incorporated under the name of the United States Mfg Co. They manufacture an odometer, the same in principle as the cyclometer, but suitable for carriages, which registers 10,000 miles and repeats, is only one inch long and one inch in diameter, and costs but $2 25.

"Above reads 23 $\frac{5}{10}$ miles."

It can be made for any size of wheels from 24 to 46 inches, and is plainly read from the seat of the carriage.

The company will make a strong bid for motor vehicle business.

SPECIAL NOTICES.

Advertisements inserted under this heading at $2.00 an inch for each issue, payable in advance.

WANTED.—The right Motor to invest in. Must be all that is desired—light, economical, safe and cheap. Address, MOTOR, care Horseless Age.

WANTED.—To furnish capital and machinery to manufacture and put on the market some good and reliable gas, gasolene, or in fact any practical motor for vehicles and stationary work. Must be first-class and practical. Address, GEORGE J. PERKINS, 111 Myrtle St., Saginaw E. S., Mich.

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Bicycles
are unsurpassed

MAKERS:
The Crawford Mfg. Co.
HAGERSTOWN
MD.

THE HORSELESS AGE.

A MONTHLY JOURNAL

DEVOTED TO MOTOR INTERESTS.

VOL. I. NEW YORK, FEBRUARY, 1896. No. 4.

THE HORSELESS AGE.

E. P. INGERSOLL, Editor and Proprietor.

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WESTERN HEADQUARTERS:
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W. A. DOUGLASS, MANAGER.

SUBSCRIPTION, FOR THE UNITED STATES AND CANADA, $2.00 a year, payable in advance. For all foreign countries included in the Postal Union, $2.50.

ADVERTISEMENTS.—Rates will be made known on application. When change of copy is desired it should be sent in not later than the fifteenth of the month.

COMMUNICATIONS.—The Editor will be pleased to receive communications on trade topics from any authentic source The correspondent's name should in all cases be given as an evidence of good faith, but will not be published if specially requested.

THE HORSELESS AGE will be sent regularly to advertisers, paid subscribers, and exchanges only.

Address all correspondence, and make all checks, drafts, and money orders payable to
THE HORSELESS AGE, 216-218 William Street, New York.

Entered at the New York Post Office as second-class matter.

The Cosmopolitan Race

Motor Competitions in General.

IN the February number of the *Cosmopolitan* magazine, the well-known New York monthly, appears the announcement of a prize offer, by the owner of that publication, to the successful contestants in a motor vehicle race to be run on May 30 (Decoration Day), over a course extending from the City Hall Park, New York City, to the publication office of the *Cosmopolitan* at Irvington-on-the-Hudson, and return. The prizes amount to $3,000, and the awards are to be made upon the following points, the maximum being 100: Speed, 50; simplicity and durability of construction, 25; ease in operating and safety, 15; cost, 10. Entries must be sent to the office of the *Cosmopolitan* before May 1.

Apropos of the route the editor says:

"The route selected for the contest of May 30, and lying between the New York and Irvington offices of the *Cosmopolitan*, is about 26 miles in length, requiring a total run of 52 miles. It passes along Broadway to Central Park, through Central Park to Washington Bridge, thence along Broadway continues to Yonkers, where the course will include five miles of asphalt pavements; then following the country Broadway to Irvington, paralleling the Hudson and passing through one of the most beautiful regions of America. The roadway over which the trial will be made is not excelled even in France."

The first thing which strikes the critic of this program is the amount of the prize offer, which at the present advanced experimental stage seems tentative and timid. The *Cosmopolitan* race is the fifth enterprise of the kind so far undertaken, and the second in the United States. In every preceding contest a larger sum was offered. The prizes at Chicago last November amounted to $5,000; the offer of the London *Engineer* for this season's contest in England is £1,000; the prizes distributed to the winners of the Paris-Bordeaux-Paris race of last June footed up a total of 60,000 francs. With such encouraging precedents, therefore, it is to be regretted that the organizer of this race lacked the confidence to name a sum sufficient to call out the full strength of the motor movement in America to-day. He would do well to increase his individual offer or supplement it from other sources.

The course selected is decidedly objectionable. It is too short for a fair test of durability, and so far as speed is concerned, which gets 50 of the 100 points, motor experts are puzzling their brains to imagine how any high speed can be expected through the principal thoroughfares of the City of New York and suburbs. The streets of a great city, even upon a holiday, are the very last place where a speed contest of any kind should be allowed. As Mr. C. E. Duryea, president of the American Motor League, says, it is simply inviting accident, and giving the palm of victory to the biggest dare-devil. The speeding of horses and bicycles is not permitted except on certain boulevards set apart for that purpose, and a hot motor race, wherein many strive for the lead together, is far more dangerous than ordinary fast driving.

Besides the actual danger of such a course, it establishes a bad precedent, spreading among the public false notions of the motor, its uses and its limitations. Instead of being an educator it is a prolific source of error. The motor vehicle is a substitute for the horse vehicle, and before the law must stand on a par with it. No exceptions can be made in its favor, and its friends ask none. They have no desire to merit public condemnation by running at breakneck speed through city streets.

In the enumeration of points of merit, on which the organizer announces that the decision will be rendered, out of 100 points 50 are given to speed, yet we have seen that the course is so unfavorable to speed that the performance of the winner must give a wholly erroneous idea of the speed capabilities of the motor vehicle. A free, open and level course is as essential for the speeding of a motor as it is for the speeding of a horse, but the speed of the motor is of little more consequence in the motor problem than the speed of the horse is in the workaday world to-day. It is the unanimous opinion of all intelligent students of this question that speed is nearly the last consideration, whereas the *Cosmopolitan* gives it first place.

In conning over the remaining points in the judicial code of the *Cosmopolitan*, we realize the difficulty of establishing a standard of merit which shall be in all respects satisfactory. These points of merit are seen to be largely interdependent and co-related one to the other. For example, simplicity of construction and ease of operation are intimately associated; so closely, in fact, that their relation approaches that of cause and effect. A vehicle which is simple in construction will generally be easy to operate, and, *vice versa*, one which is complicated in construction will generally be difficult of operation.

Again, ease of operation is clearly connected with safety. The term safety as referred to a motor vehicle cannot be confined to the nature of its motive power. A vehicle whose motive power is the safest that can be devised, an electric vehicle, for instance, may yet be positively dangerous in service, because of defects in its steering and speed-changing mechanism. In crowded streets, at every turn, the ready control is imperative if accidents are to be averted.

Here we come to the phase of the question which is being minimized by writers, inventors, and by organizers and judges of motor competitions. It is the phase which cannot be properly exhibited in a race over a straightaway course, nor on the boulevard, but can only be revealed by actual use, or by, so far as possible, artificially reproducing the conditions met with in city streets. The sudden stop, the quick spurt, the instantaneous turn to avoid mishap; in short, the unlooked-for and unexpected conditions which every minute of the day confront the driver of the horse. In this aspect of the case, control rises in importance, speed sinks relatively, and we must conclude that while the motor racer will doubtless find its place in the future, it is not to be confounded with the practical vehicle for every day use.

Cost, at the present time, is of subordinate interest, the main interest centering upon practical mechanical features.

To organize a test that would be fairly conclusive on the point of control, and one that could at the same time be witnessed by spectators and judges, does not appear to be an impossibility. A field manœuvre, in which all the competing vehicles could be assembled in a small level enclosure, and required to perform a variety of evolutions in confused mass, would present some of the difficulties of the streets. An athletic ground or similar property might be engaged for the occasion and a reasonable price charged for admission. Each vehicle being in competent hands would be shown off to the best advantage. Any collisions that might occur would not be likely to result seriously, as slow speeds only would be allowed. No contestant would be permitted to follow a regular course round the enclosure, but would be expected to keep constantly mixed up in the throng of moving vehicles. The vehicle which was most readily managed would be adjudged the winner on this point. An exhibition of this character would be a pretty and novel sight, and would certainly give evidence of great value in determining the relative merits of steering and speed-changing devices.

Another very attractive feature which might be introduced at motor-vehicle competitions is a parade of all vehicles which are to participate in the competition. Being witnessed by thousands of citizens it would advertise the subject widely, and would undoubtedly increase the attendance at the exhibition, which should be opened by the parade. At the exhibition, held at some central point in the city, vehicles could be closely examined by visitors, and their mechanical peculiarities fully understood. This exhibition should last a week or two, and would surely be attended by thousands from the city, from all parts of the United States, and from Europe.

The race should be over a long course, with different kinds of roads, and grades both steep and long, in order to afford a fair test of durability and speed. So far as the latter point alone is concerned it could be better determined on a race track, as Mr. Duryea suggests, but an exhibition of that character would scarcely equal a horse race in public interest. Hence, with respect to its advertising value, which is of the utmost importance to the general cause, it would be far inferior to the long run into the country and return. A course of about 150 to 200 miles would be sufficient to centre the attention of the press and the intelligent public upon the event. A number of suitable courses might be found in the vicinity of New York. The beautiful region of the Oranges, in New Jersey, has been suggested as most desirable for such a contest; Jersey City to Philadelphia and return has also been mentioned as a good course.

Great precautions should be taken to prevent accidents *en route*. Towns along the line should be apprised in advance of the approach of each vehicle, so that the streets may be clear, and the danger of running over sightseers or colliding with other vehicles reduced to a minimum.

With a parade, an exhibition, a field manœuvre, engineering tests and a race, motor vehicle week would be a gala week, large numbers of excursionists would be drawn to the city, the motor vehicle would be extensively advertised by the press of both continents, and an immediate impetus would be given to the new industry.

The time is ripe for an undertaking of this character in America. The public would appreciate it. The diverse features offered would appeal to all, and would present a complete and practical idea of the motor vehicle, and not the one-sided and inadequate conception which a course and judicial code such as have been chosen by the *Cosmopolitan* must necessarily give.

The whole program seems to have been planned in the editorial sanctum without investigation or advice, and with a motive little broader than to discover to the world the rural publication department of the *Cosmopolitan*.

On another page of this issue will be found a number of letters from men prominent in the new industry, giving their views of the *Cosmopolitan* race, and of such contests in general.

More Philological Bric-a-Brac.

EDITORS and inventors still continue to wrestle with the dictionaries in the hope that some choice inspiration will settle the question of terminology. In fact, just at this stage of the movement there are rather more names than motors in the market. Even that huge leviathan of newspaperdom, the *London Times*, bestirs its huge proportions to take a hand in the little by-play. "Autocar" is its favorite among the large and growing assortment of philological bric-a-brac which the motor movement is producing. The *Electrical Engineer*, of London, gives us motor car.

A Western inventor writes the editor of THE HORSELESS AGE that he has christened one of the motor vehicles he has built an "automaton," and appears to take more pride in the name than in the vehicle, for he says nothing further of the latter.

Still another Quixote in search of a name sends in the word "mocle" as a final solution of the whole matter, for is it not a happy compromise between motocycle and motor vehicle?

Wise men tell us it is characteristic of human nature, once it starts upon a wrong course, to stray continually farther from the paths of rectitude. A like degeneracy marks the career of the word-coiner. The last examples of the malady are worse than the first.

A heterogeneous array of imagery it is which is called up in the mind by these chasers of word phantoms, who would stick new words onto a language as they stick postage stamps onto letters. Let us summon the motley train: Acrobats, alcoholic headaches, Pullman palace cars, bicycles, dime museum freaks, squint-eyed dudes, etc.—everything but motor vehicles is suggested.

The mechanical problems pertaining to the motor are not sufficiently engrossing for the inventor, it seems. He finds ample leisure for incidental divertisements in language, possibly to relieve the tedium of his mental labors. Viewed in this light, we can all join heartily in the fun with the hope that the mechanical mind will return with new vigor to its task.

But, seriously, isn't it about time for another act of the real play?

The truth is, motors are to be applied to all classes of vehicles, and it will no more be possible to describe them all by one name then than it is now—save by the common generic term—vehicle.

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Legislation Against Petroleum Boats.

A SHORT time ago a bill was introduced in the United States Senate, providing that all naphtha, gasolene and kerosene motor-boats should be brought under government inspection, and that licensed engineers should be required for them as they are for steam launches now. This bill died an easy death in the committee room, but the animus which inspired it did not die with it. On Feb. 3 a bill of similar tenor was introduced in the New York State Senate by Senator Seibert, and referred to the Committee on Commerce and Navigation. This bill, which is entitled "An act to regulate qualifications of persons who operate and manage boats and launches employing oil, naphtha and electricity as propelling or motive power" reads as follows:

"Section 1.—It shall not be lawful for any person or persons to operate or manage any boat, launch or vessel using as propelling or motive power oil, naphtha or electricity, unless such person (or persons) is a duly qualified engineer procuring a certificate of qualification therefor, authorizing such person or persons to act as engineer pursuant to the statute of this State.

"Section 2.—Any violation of this act shall be punished as a misdemeanor.

"Section 3.—This act shall take effect immediately."

It is probable that this bill will share the fate of its predecessor at Washington, for there is not the slightest reason for any such restriction. The record of the petroleum launch is singularly free from accident, differing in this respect from that of the steam launch. If any additional government inspection of small boats is needed, it is needed for sailboats, which are certainly the most dangerous of all small craft, particularly in inexperienced hands. Every Summer squall in New York Bay bears witness to the truth of this statement. Yet no one comes forward with an act requiring such boats to be in charge of licensed skippers. Much less is there any need of licensed engineers for motor boats. The people are becoming their own engineers, and the knowledge necessary to operate a petroleum boat can easily be gained by any one.

The true cause of this antipathy to the petroleum boat is to be found, not in the representation that it is unsafe, but in the fact that it is crowding out the steam launch, which is convincing proof of its safety.

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STEEL TUBE MAKERS, ATTENTION!

THE extraordinary development of the bicycle industry has given a corresponding impetus to the manufacture of steel tubing which is used for bicycle frames. Notwithstanding the erection of a number of new plants in the United States and a great increase in the importation of English and German tubing, the demand still exceeds the supply. Capital has been caught napping. It has neglected a plain opportunity for profitable investment, and new consumers of tubing search the market in vain for a source of supply. Now, close upon the heavy orders of the bicycle manufacturers comes the intimation of a new demand from the manufacturers of motor vehicles. The importance of this new outlet is probably not yet fully realized by the tube manufacturers, whose entire attention has necessarily been given to the needs of the bicycle trade, but its influence must soon be felt, compelling the extension of tube plants already in operation and the founding of new ones of large capacity. It is to be hoped that the tube famine in the bicycle trade has taught the manufacturers a lesson, and that they will be prepared for the demand which is now almost upon them.

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BUILD FOR ORDINARY CONDITIONS.

SOME motor inventors seem to be building vehicles to meet extraordinary conditions, or accidents, rather than for ordinary use. A motor vehicle for light pleasure purposes need not be a battering-ram. It is not advisable to keep ever in mind possible collision with other vehicles or objects still more solid, for by so doing we lessen the practical utility of the vehicle.

The bicycle is a very light and comparatively frail machine. When it comes into collision with a heavy wagon, a fence, or other obstruction, it is generally badly wrecked, yet no manufacturer of bicycles would think of trebling the weight of his machines on this account. The wheels would then be too hard to propel and riders would refuse to buy them. But this is exactly what some builders of motor vehicles are doing. The extraordinary accident fills their minds and the ordinary conditions are forgotten. Build for ordinary conditions and let the extraordinary take care of itself.

MOTOR VEHICLES FOR TRAVELING MEN.

The vision of the future of the motor vehicle is kaleidoscopic; so many and interesting are its phases. One of its spheres of usefulness we already see foreshadowed by the bicycle. Many traveling men who have small towns to visit make their rounds on bicycles to-day, and find that they save both time and money. A light motor carriage will prove still more economical and expeditious to the traveling man who is not overburdened with samples, and for those who carry large sample stocks, special wagons can be built that will entirely abolish express and truckmen's charges.

The Chicago Motor Tests.

We lay before our readers in this issue the full report of the engineers who conducted the tests of the motor vehicles at Chicago last November. This report will undoubtedly be very carefully studied by motor experts for some time to come. Some of the results are rather surprising, and reveal defects which will be the more easily remedied because of the data contained in this report. Mr. Kohlsaat's innovation in providing for these tests was a good one, and his example should be followed by other organizers of motor competitions.

The Age of Noise.

The last decade of the nineteenth century is pre-eminently the age of noise. In the general pandemonium the clatter of iron hoofs, the clash of steel tires, and the creak of ball-bearingless axles are prominent factors. When the motor comes in, with its rubber tires and improved bearings, and the sound of iron hoofs becomes infrequent in our streets, then we shall realize that one of the blessings of the motor vehicle, and one, perhaps, we had not fully anticipated, is that it is a conqueror of noise.

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A reader of The Horseless Age takes the editor to task for our little attempt at spelling reform in adopting the uniform termination "ene" for kerosene, gasolene, benzene and acetylene. Our critic seems to infer that this was intended to apply to the whole family of hydro-carbons. Such was not the intention. The use of the word "these" limited the sense to the four hydro-carbons enumerated. The fine distinctions of chemistry are not needed in common speech, nor does a change of spelling seem the best method of expressing these distinctions even in chemistry. The symbols remove all doubt.

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Dr. J. Allen Hornsby, editor of the *Electrical Journal*, Chicago, and secretary of the American Motor League, has this to say about the vagueness of many claims advanced by motor inventors, and the expressed desire of the editor of The Horseless Age to give the preference to more exact information: "If The Horseless Age will adhere to this plan, it will do much for the interests of the motor vehicle. Some manufacturers have been close followers of the late lamented Baron Munchausen, and while we are fond of fiction we do not like it mixed with science or the industries."

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As regards motor-vehicles there are two kinds of extremists. Those who believe that because they have uses they have no limitations, and those who believe that because they have limitations they have no uses. The editor of The Horseless Age wishes to steer clear of the Scylla of the wild enthusiast on the one hand, and the Charybdis of the cynic on the other, and promulgate sane views on the subject.

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It is said the world hears of the successful achievements of an inventor several years after he has accomplished them. Ordinarily, it is a long way from the workshop to the street, but in the case of the motor movement the distance is being greatly shortened. The world is keeping fairly well *en rapport* with inventive progress. The Horseless Age is in part responsible for this.

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Recent models of motor carriages show a great improvement in style and appearance over those of last year. There is still room for improvement, however, though utility takes the precedence over beauty. The practical vehicle will soon take the shape of beauty.

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The remarkable success of both the New York and Chicago Cycle Shows gives an inkling of what the motor exhibitions of the future will be. In magnitude, variety and interest they will even surpass the cycle shows.

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The motor carriage and the motor boat are developing side by side. Scores of builders of skiffs, launches and sail boats are preparing to add power to their product, and that power in almost every instance is the gasolene or kerosene motor.

IN THE WORKSHOPS.

The water jacket, which has heretofore been deemed necessary to the satisfactory performance of the gas engine, is admitted to be a troublesome complication in the vehicle motor, and many devices, internal and external, are being resorted to in the endeavor to do away with it. Some of these are very ingenious, and will be described in a forthcoming issue of THE HORSELESS AGE.

As between gasolene and kerosene as a fuel for motors the verdict seems to be in favor of kerosene, because of its greater safety. In some respects, however, kerosene is more difficult to regulate than gasolene. One of its disagreeable features for motor use is the heavy odor of its products of combustion. This difficulty is in a fair way to be overcome by the employment of some cheap chemical filter in the exhaust, which will extract the noxious odors, and leave the exhaust quite unobjectionable.

The gas engine is a heat engine, and heat is power. While some inventors in the motor line are endeavoring to avoid the use of the water jacket by accelerating the radiation of heat from the cylinders, others are taking the opposite course, and are endeavoring to prevent the loss of heat through the walls of the cylinders.

To the readers of THE HORSELESS AGE, who fear that the motor carriage will be a noisy machine, it should be stated that several devices are already in use which effectually muffle the sound of the exhaust. The winning wagon at Chicago on Nov. 28, was practically noiseless. The impact of a horse's hoof, even on a dirt road, is much more noticeable than the smooth tread of the rubber-tired wheels of the motor carriage.

Another objection which was raised against the motor vehicle some months ago has been silenced. We refer to vibration which was a noticeable defect in the foreign carriages of 1895. Recent improvements abroad have almost overcome this difficulty. Balanced cylinders, rubber cushions separating the body of the vehicle from the motor and framework, have gone far to correct the evil. Still other and more effective devices are now said to be in the workshop on this side of the water.

A well-known electrical firm are bringing out a magneto for sparking gas motors, which is said to effect a great saving in batteries, it being necessary to use the battery only for a short time in starting the motor, after which the magneto becomes charged and performs the work.

The ratio of power and weight seems to be a vexed question in many minds. It is the prevailing opinion that the motors now employed on carriages have insufficient power, and builders are advised to increase the power of their motors. Before accepting this advice, however, builders should ask themselves whether it is not possible to effect a general reduction in weight, and by simplifying the transmission mechanism, avoid loss of power. The true mechanical principle lies in the economical use of power.

The high horse vehicle is rapidly going out of date among motor builders, and the low vehicle is taking its place. Let us blot the horse from our minds, and then we shall be able to construct motor vehicles on scientific principles.

The wood or wire wheel question seems to be coming gradually to a solution. Messrs. Peugeot Freres, one of the leading firms of France in this line, build all their vehicles with wire wheels, and state that in the race from Paris to Bordeaux last June, their wire wheels stood up better than the wooden wheels of their competitors. The motor wagon of M. Rossel, illustrated in this issue of THE HORSELESS AGE, also has wire wheels, and the same style of construction is being followed by some of the leading inventors in America. Steel construction is the strongest, for its weight, known to mechanical science. It has superseded wood in modern buildings and bridges, and will supersede it largely in vehicles. In adopting this construction for the frames and wheels of light passenger vehicles, builders are guided by safe precedents.

Petroleum Carriage of M. Rossel.

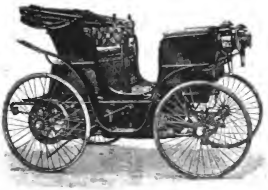
La Locomotion Automobile for January contains an illustrated article on the petroleum vehicle of M. Rossel, which was exhibited at the Salon du Cycle recently.

The vehicle, which is a vis-a-vis, weighing about 1,600 pounds, is propelled by a Daimler motor.

The frame is of tubular steel, and as it serves also as a cooling receptacle for the water which surrounds the cylinders of the motor, a journey of 30 or 40 miles can be made without renewing the supply of water.

The wheels are of steel wire, and the tires of solid rubber. The hind or power wheels have tangent spokes, while the front, or steering wheels, have straight spokes.

The steering mechanism, like the axles, is mounted on ball-bearings, so that the steering is easy.



The main shaft of the motor is lengthwise of the vehicle, and engages with a secondary shaft parallel to it, controlling gears giving four changes of speed, from 3 to 15 miles.

There is also a third shaft, parallel to the axles of the vehicle, which controls the equalizing gear, and operates the pinions, which, by means of chains, transmit the power to the rear wheels.

The vehicle has two brakes, a foot brake acting upon the shaft controlling the differential gear, and a hand lever acting directly on the driving wheels.

All the levers are assembled on one stand at the right-hand side of seat. At the top are the steering handles, below them are three levers; those on the left controlling the changes of speed and reversing, and the one on the right being the hand brake. The other small lever on the right acts on the regulator of the motor, and accelerates or decreases its speed.

One of the advantages claimed for this vehicle is that by this massing or centralizing of levers, the operator is enabled to give his entire attention to the route before him.

Practical Points on Motors and Gases.

BY M. H. DALEY.

In order to make a successful motor carriage it is necessary to have a motor of light weight.

The ordinary gasolene engine is altogether too heavy and clumsy, as is also the steam engine, with its boiler, water and fuel. The electric motor is light enough, but the storage batteries necessary to run it any considerable time are far too heavy. The electric motor, outside of this one objection, is far the best, because, its motion being rotary, there is no vibration; it occupies very little space, makes scarcely any noise, and is odorless. But there is another serious reason why it cannot come into general use. As the storage batteries have to be re-charged at an electric plant, it is not practical outside of cities having electric light plants, or at least a dynamo and power to run it. Besides this, good roads are required for wagons heavy enough to carry enough storage batteries to run 100 miles. Therefore I consider it settled that for long distances over country roads, for use in country towns or for traveling purposes the electric motor at present is not practical.

The steam engine presents many objections that may be overcome. Perhaps in time the engine might be made of aluminum or steel. The furnace and boiler might be made of better and lighter material. Kerosene oil can be used as fuel by employing a jet of steam to atomize it. The steam, after being used, could be condensed to avoid puffing into the open air, and could be used over and over, so that a small quantity of water would answer for a considerable time. But as yet no practical steam engine for the motor carriage has been produced, to my knowledge.

Hot air is another expansive force that can be used. The hot air motor can be constructed like a steam engine. The air can be pumped in as we go along, so that no supply has to be carried, as is true of water, for steam. Of course, the air has to be pumped into a small receptacle situated within a furnace burning oil, and hence it is necessary to pump it in against a pressure. This seems to be the main objection, for it takes a considerable proportion of the power produced to pump in the air.

The gasolene motor is practically a hot air engine that does not require the air to be pumped in against a pressure. It should be made of steel or aluminum to get the greatest possible strength with the least possible weight. The material should be the best that can be procured.

The cylinder should be made either from cold drawn seamless tube or bored from a solid shaft of the best quality of machinery steel.

I consider the latter the best, as the head can be left solid, fast to the cylinder, and raised rings can be turned up from the outside, over which can be slipped the water jacket. The cylinders should be about twice as long as the stroke of the piston, so as to give plenty of bearing for the latter. Two cylinders should be used to avoid vibration caused by the lateral motion of the piston rod, crank and piston. Where two are used smaller cylinders can be used to get the same power, thus lessening the vibration caused by concussion each working stroke and lessening the amount of the exhaust.

There are various designs of gasolene engines, but the working principle of all is about the same. Four strokes of the piston form the complete cycle or action, and give only one working stroke.

The operation is about as follows: The first stroke of the piston, which is toward the crank end of the cylinder, draws in the air through the carburetor, into which the gasolene has been pumped. A valve called the inlet valve opens to let the air in, and closes to keep it in during the return stroke. The piston, on the return stroke, compresses the air into about one-fourth of its natural space. Now, just as the piston is about to start toward the crank again, the compressed air and gas mixture is set on fire inside the cylinder by producing an electric spark.

The gas mixed with air is very inflammable. As soon as the spark is made the gas burns instantly. This heats the air and expands it, forcing the piston out and giving power to the crank shaft on which is a balance-wheel, to give momentum sufficient to return the piston. Just before the piston returns the outlet or exhaust valve is opened by mechanism which moves a lever for that purpose every second revolution, the burned gas and hot air rush out and are expelled by the fourth stroke of the piston. The exhaust valve now closes, and the engine repeats the same cycle every two revolutions of the crank shaft.

I wish to correct an erroneous impression prevalent among the people in general that gasolene is explosive. Gasolene by itself will not burn, nor will the rich vapor we call gas, until it is mixed with air. Even when open to the air there is no danger of an explosion. It is only when it is confined in something and mixed with air that an explosion can occur. Any one can demonstrate this to his own satisfaction by pouring a quantity of gasolene into a plate or saucer and trying to explode it. He will find that it will burn on the surface only and continue to burn until consumed, but if a thimbleful is thrown into a hollow stone with fire in it, it will explode and probably do damage, and possibly blow the stone to pieces. But there is no danger so long as it is confined from the air or open to the air in an open vessel. The danger comes from confining it with air in any place where heat or fire is present.

I have made this so plain that any one can see there is no danger in using gasolene motors, for the only place where the gasolene is mixed with air and confined in anything is in the cylinder, and then not over three drops is used at a time in a two horse-power motor. If gasolene has been left open in a room, or spilled upon the floor, it vaporizes and it is then dangerous to let a lighted lamp come in contact with this vapor, because, as soon as any part of the vapor is set on fire, it flashes instantly. If the room is small and the whole air within is saturated the burning gas expands the air all over the room in an instant. Now, the pressure of the atmosphere is about 15 pounds to the square inch, both outside of the room and inside. It is readily seen that if the air inside expands to three times this pressure there would be 30 pounds more pressure to the square inch on every inch of the walls of the room inside than outside, and the walls of the room would be blown a considerable distance and possibly the whole house destroyed.

This is what is called an explosion. But the gasolene does not explode. It simply heats the air all over the room whenever the vapor burns, and the air so heated expands and has to seek larger quarters.

If 15 per cent. of gas vapor and 85 per cent. air burns there is no odor or smoke.

If the motor cylinder is made quite long, and only half a cylinder full of air is drawn in and compressed to four atmospheres, it is evident that after ignition the air can expand twice as much as when a cylinder full is taken in and compressed. This gives more power out of the same amount of gas before it is expelled and less noise in exhausting. This can easily be accomplished by having the spring on the inlet valve sufficiently strong to retard the entrance of the air.

The space behind the piston, in which the air-gas mixture is compressed, should be one seventh the length of the stroke of the piston, in order to get the compression of four atmospheres after taking in half a cylinder full of air.

The electric spark is preferable for ignition. One electrode passes through the cylinder, and is insulated from it by the use of mica, which surrounds the electrode, and separates it from a plug through which it passes. This plug is screwed into the cylinder, one end of the electrode being outside, and having attached to it the wire from one pole of the battery.

The other electrode need not be insulated, but may pass through the cylinder in such a way that it is actuated or turned from the outside. The inner end of this electrode should be so bent that by turning the electrode it comes in contact with the insulated one inside the cylinder. Both electrodes should be covered with platinum to prevent corrosion, and at the point of contact one should slip on the other, enough to keep it wiped clear of smoke, soot, etc., and insure the contact.

The electrodes should be connected while the piston is compressing the charge during the last half of its stroke, to insure sufficient time for the electric current to magnetize the spark coil, and should be quickly parted just as the piston is about to make the change of motion, usually called the dead point. By this method the circuit is open about seven-eighths of the time, and should be open all of the next revolution, thus saving the battery.

The governor should be in the balance wheel to avoid the necessity of gears or complicated parts, and should be very sensitive to ensure steady motion.

In governing it is best to hold the exhaust open and stop the gasolene pump, as this expels all the smoke from the cylinder.

The best means I have found of connecting the motor to the hind axle of the carriage is the same as that used on the trip hammer, simply a loose belt and a tightener attached to a lever. This is very simple. There is nothing to get out of order and by pulling upon your tightener you get any speed required.

The motor carriage is an assured fact. The trouble now will be to educate the people who want to use them. It will be necessary for them to know as much about every part of the mechanism as it is for a lady to know how to use and adjust her sewing machine or the farmer to run his mower or binder.

We cannot expect the public in general to be all mechanics or experts. It will take time for them to learn how to run them, but the next generation will grow up to the knowledge of their construction, just as our young boys and girls are familiar with the workings of the bicycle.

The time is not far distant when liveries will be supplied with motor-carriages, and people can ride on lines of stages as in olden times, but stages that will make quick time and at about the same fare as railways now charge. These motor-carriages will be entirely enclosed as railway coaches are, will have windows and can be heated by the exhaust in cold weather.

* * *

The Duryea Motor Wagon Company have entered in the *Cosmopolitan* race.

MOTOR VEHICLE TESTS.

The Engineers Submit Their Report of the Tests Made at Chicago—Valuable Data for Makers and Users Alike.

John Lundie and Leland L. Summers, the engineers appointed to conduct the tests of motor vehicles made at Chicago previous to the race of Nov. 28, have submitted their report, which we reprint from the Chicago *Times-Herald* as follows:

In selecting a method of testing the vehicles submitted, an effort was made to adopt a system which would enable a comparison to be made directly with the methods of propulsion at present in use. To some extent this involved the economic aspects as well as the engineering features of the question, so that it has been deemed proper to briefly consider some of these.

The question of practicability, or whether the self-propelled vehicles can accomplish the results obtained by vehicles as ordinarily propelled, is, perhaps, the question of first importance, and in considering comparatively the results, naturally the horse would be selected as a basis of comparison. To enable this comparison to be made without involving the subject in undue technicalities, a brief digression, dealing with the early investigations of the power of the horse, may not be irrelevant, particularly as the horse has long been a source of motive power, and for this reason was early selected as a comprehensive unit of comparison.

HORSE POWER THE UNIT.

With the advent of the steam engine it was found necessary to compare the rate at which the engine could do work with the rate at which a horse could do work, in order that the purchaser of an engine could specify the power required in a unit he was familiar with. As the power the average horse was capable of exerting had been but indefinitely determined, experiments were made by James Watt to obtain definite figures, and for this purpose a weight of 150 pounds was arranged to be raised by the horse, when it was found that the weight could be raised at the rate of two and one-half miles per hour, or 220 feet per minute (Fig. 1). Multiplying the weight in pounds by the feet traveled per minute, Watt obtained 150 × 220 = 33,000 foot pounds per minute as the power which the horse could exert. This power could be exerted for eight hours per day, but for a fewer number of hours per day a higher rate of doing the work could be developed. Numerous experiments made since those of Watt have indicated that Watt's measurements were upon horses far above the average; the best authorities agreeing that the power of an average horse should be considered about 22,000 foot pounds per minute. Upon this basis a table (Trautwine's Pocketbook) of the pull a horse could exert and the corresponding speed in miles per hour would be as follows:

Miles per hour.	Pull or traction.	Miles per hour.	Pull or traction.
Three-fourths	333.3	Two and one-fourth	111.1
One	250	Two and one-half	100
One and one-fourth	200	Two and three-fourths	90.9
One and one-half	166.6	Three	83.3
One and three-fourths	142.8	Three and one-half	71.4
Two	125	Four	62.5

It is evident that not only can the horse exert a heavy pull at a low speed, but that it is capable of exerting a wide range of pull which makes it particularly suitable for the purpose of hauling vehicles. Experiments differ as to the maximum pull the horse can exert, and the conditions of footing, character of load, etc., greatly affect the results. For the purpose of determining roughly a probable value, an express horse of average type was tested by your committee, and, without resorting to violent methods of persuasion, the maximum pull obtainable was found to be about 250 pounds. It is probable that 400 pounds is about the maximum with a good horse. On the other hand, when the pull is light a considerable range of speed may be obtained, and a measure of the power exerted by the horse at all times may be obtained by multiplying the pounds pull by the speed in feet per minute. Dividing this by 33,000 gives the ordinary unit known as the horse power. The figure of 33,000 foot pounds per minute obtained by Watt is commonly adopted as the number of foot pounds per minute constituting a horse power.

The determinations actually made of the pull required of a horse in pulling a vehicle are not very numerous or authentic, as owing to the fact that the pull is apt to be irregular many difficulties are encountered in measuring it, and no great accuracy is attainable.

A comparison of the motocycle with the performance of a horse involved then a measurement of the pull the vehicle could exert, and a determination of the speed the pull was exerted at. A testing machine was accordingly designed with the primary object of measuring these factors. The power of the vehicle was readily obtained from these by multiplying the pounds pull by the feet per minute traveled. This being divided by 33,000 would then give the mechanical horse-power exerted by the vehicle on the rim of the wheel at any instant. As this power measurement of the vehicle would determine its ability to propel itself under different conditions, a measurement of the fuel consumed in accomplishing this would enable the item of cost to be obtained. The net results, therefore, sought were how much power would be available at the rim of the wheels for a given expenditure of money.

In the case of a gasolene engine a measurement of the gasolene consumed in a given time, while the motocycle was exerting a given power, would enable this cost to be determined directly. In the electrically propelled motocycle a measurement of the power consumed in producing a given power at the rim of the wheel would enable one to calculate the cost of propulsion when the cost of electrical power for charging the batteries was known. In addition to considering the cost of producing a given amount of power at the rim of the driving wheels, it was considered advisable to determine, if possible, the losses between the driving motor and the rim of the wheels. These determinations would show how efficiently the power generated by the motor was transmitted to the wheels of the vehicle. The various methods adopted of regulating and controlling the speed and power of the vehicle might also affect the consumption of fuel and result in a less amount of power being available for a given amount of money expended in fuel. Very accurate data is available concerning the usual types of motors, similar to those used for propelling vehicles. This data is confined almost entirely to their use for stationary purposes, however, and very little information is extant regarding their application to vehicles.

FUEL TESTS.

Under these circumstances somewhat extended tests were made to ascertain the consumption of fuel and performance of the vehicles under the various loads apt to be imposed in practice.

In order that the same conditions might exist for all gasolene vehicles under test they were all supplied with gasoline from the same barrel, the density of which was found to be 0.688. No effort was made to obtain a particular density of gasolene, as it was deemed best to use that ordinarily to be obtained from the retail dealer. Cost of gasolene has been estimated at two cents per pound in deducing the results shown in the appended table.

The cost of electrical energy has been estimated at 10 cents per kilowatt hour. The storage batteries are assumed to have an efficiency of about 75 per cent., making a cost per horse-power hour delivered to the motor of 10 cents.

MAXIMUM PULL OF VEHICLES.

In order to still further compare the performance of the motocycles with that of the horse, efforts were made to determine the maximum pull which the vehicle could exert as compared to that of the horse. It is evident this would only be of interest in determining the performance of the vehicle when operating under extremely unfavorable conditions, and in this connection it is only fair to add that the vehicles submitted were all designed for a light passenger service and not to exert a heavy pull, so that a medium pull exerted at a high average rate of speed was the object sought rather than a heavy pull under adverse conditions. For determining this feature the pull on the motocycle was increased until the limiting conditions were reached, with the results shown.

It is apparent that the heaviest pull exerted, viz., that with the Duryea vehicle, amounted to only 187 pounds as compared to 400 pounds which a single horse could exert. It was not possible in any of the tests made to slip the driving wheels, so that the traction in all cases was ample, and if a greater driving power had been available by means of reducing gearing or otherwise it would probably have been possible to obtain a correspondingly high result. In the case of the belt driven machines of the Benz type, the limit was usually reached when the belts slipped. Owing to the defective conditions of the belts on the Macy machine, which possessed one of the most powerful motors of any of the vehicles submitted, the maximum effort was not obtainable. The Lewis motocycle was equipped with a special reduction gear enabling a very heavy pull to be produced. An effort to obtain this heavy pull from the vehicle resulted in the breaking of the driving chains. Under these conditions it is hardly fair to consider the results as the best obtainable. In the machines directly geared any attempt to obtain heavier pulls than those given resulted in stalling the motors. The pull obtained with the electrical vehicles is, of course, only limited by the heating effects of the excessive current required.

It will be observed that there is a wide difference in the consumption of gasolene by the various engines submitted. This is naturally to be expected when the types of engines are considered. In the case of the Lewis and the Haynes & Apperson vehicles the cycle is such as to give an explosion every revolution, the piston itself uncovering the exhaust port, this type of engine being variously known in stationary practice as the Single, Sintz or Day cycle. The exhaust from these engines was so densely laden with unconsumed carbon that an exhaust pipe and fume blast were required to convey the fumes from the testing-room. This simply bears out the well-known fact that this type of engine, giving an explosion for every revolution, while possessing many advantages, has a very low economy due to the improper combustion of the fuel supplied. The other motors presented were almost all operated upon the Otto cycle. In the Benz type of motor the gasolene was thoroughly carburetted before being admitted to the cylinder, while in the Duryea and others the gasolene was vaporized directly at the cylinder. The results obtained therefore enabled a partial comparison to be made between these methods of utilizing the gasolene.

It is to be regretted that owing to a derangement of the igniting mechanism in the Duryea engine, higher power tests were not possible with this vehicle.

It is a well-known fact in gas engine operation that the economy of the engine at light loads is, if anything, inferior to the steam engine under similar conditions. In the application of the gas engine to a motocycle the economy is particularly low for the reason that a considerable proportion of the power is sacrificed in driving the mechanism. Owing to this feature the consumption of gasolene per horse power hour at the rim of the wheel is quite large when the motocyle is operated under an ordinary load. Thus with a load requiring about three-quarters of a horse power for its propulsion, it is evident that as high as one and one-half horse power may be required in the engine in order to overcome the friction of the mechanism. If the motor is designed to give three or four horse power at the rim of the wheels, the motor is lightly loaded under the ordinary conditions, and the economy as a result is very low.

In this connection the Benz type of vehicle presents another interesting feature of comparison. These vehicles are provided with but two ranges of speed when the gas engine is running at its normal speed, and in order to increase the range of control the supply and proportion of the mixture of air and gasolene is varied. This is accomplished by a regulating valve controlled from the driver's seat. The explosive force of the mixture is readily controlled in this way, and a wide range of speed is thus given to the vehicle without the necessity for complicated mechanical devices for speed regulation. This simplicity and ease of control may, however, be purchased at the expense of economy, as will be apparent from the tests of various loads.

It is evident that under the best condition of load a horsepower can be produced at the rim of the wheel with almost one-fourth the rate consumption of gasolene that it can under the worst conditions. With a type of vehicle such as the Duryea, where the speed of the gas engine is maintained constant, and the speed regulation is affected by changeable gearing, the economy with variable speed of the vehicle is dependent entirely upon the load carried by the engine. Under some conditions, therefore, it is possible for a motocycle to ascend grades at the same speed as upon a level road and with the same consumption of gasolene. In other words, the loading of the engine may so increase the efficiency that it will enable it to give the increased power without increase in the consumption of gasolene. As far as possible it was endeavored to ascertain if the jolting of the vehicles using a carburetter would affect its action; in other words, if the explosive character of the mixture was varied by the effects of the vibration of the vehicle. So far as could be determined no effect was noticed in this respect; the carburetter apparently at all times supplying an even mixture.

The location of the driving engine and the method of transmitting the power to the driving mechanism greatly influences the amount of vibration there is to the vehicle. In the Benz type of vehicle the single cylinder engine, giving an explosion at every second revolution, is mounted with the cylinder at right angles to the axle of the driving wheels. The effect is to cause considerable vibration, and unless special means are adopted for counteracting this, it is transmitted to the body of the vehicle, resulting in more or less discomfort to passengers at the time of starting, although afterward it is not so noticeable. In the Duryea vehicle the two driving cylinders are parallel to the axle of the driving wheels, and any reactive effect from the cylinders produces a vibration transversely. The vehicle of Messrs. Haynes & Apperson is provided with two cylinders, one on each side of the crank shaft, and the reactive effect is greatly diminished.

From the consideration of these questions it would appear necessary to use more than one cylinder to eliminate vibrations, and preferably these cylinders should be arranged upon opposite sides of the driving shaft in order that the reactive effect may be entirely balanced and the vehicle freed from vibratory effects when the engine is running, though not propelling the vehicle.

ELECTRIC VEHICLES.

In considering the electric vehicles it is evident that in using a variable current from the storage batteries as the discharge rate is increased beyond the normal, both the life and efficiency of the battery will be diminished. In the Morris-Salom vehicle the batteries were rated at 50 ampere hours, with a discharge rate of five amperes. When discharging at a rate of 22 amperes it is evident that the available capacity of the cells will be greatly diminished. It is perhaps unfair to assume therefore that the efficiency will remain constant. While the mechanical efficiency is higher with a heavy load, the electrical efficiency as a whole may be diminished. The correction necessary for these factors will depend so largely upon particular conditions that no allowance has been made for them. The assumption of 75 per cent. efficiency in the batteries will be a fair average for normal conditions. The cost of electrical energy will also vary with the conditions, so that both of these factors must be considered in estimating the cost of operation. The heavy depreciation of the batteries when subjected to excessive discharges will also constitute a charge against cost of operation.

SINGLE AND DOUBLE MOTORS.

An interesting comparison may be made between the Sturges vehicle and that of Messrs. Morris & Salom. Both of these vehicles are equipped with the same type of motor, the Sturges vehicle being propelled by a single motor of three horse-power, while that of Messrs. Morris & Salom is propelled by two one and one-half horse-power motors. A single axle with the wheels solidly mounted, the carriage being carried by the journals on this shaft after the pattern of a car journal, is the method of driving adopted in the Sturges vehicle, while in the Morris & Salom the pinion on the motor is geared directly to the driving wheels, the wheels being provided with ball bearings, and every effort being made to diminish friction.

The tests indicate that with the best workmanship possible the two motors have but slightly higher efficiency than the single motor, though the mounting of the single motor is in a measure crude. The electrical and gear losses with two motors, would, of course, be greater than with a single motor. The advantages of the series-parallel control of the motors when storage batteries are used, and may be grouped to regulate the voltage, does not, therefore, seem necessarily to be a factor of sufficient importance to warrant the adoption of two motors. Apparently the only other factor to particularly commend this arrangement is the ellimination of a differential gear for enabling the wheels to travel independently of each other when curves or corners are being turned. In driving with a single motor of any type it is evidently necessary to provide a

TABLES.

TABLE NO. 2.—POWER AND DUTY TESTS OF MOTOR VEHICLES.

Vehicle.	No. of run.	Speed in feet per minute.	Pull exerted—pounds.	Horse power exerted at rim of wheel.	Horse power consumed in mechanism.	Total horse power developed in cylinder.	Mechanical efficiency.	Gasolene—pounds consumed per hour.	Gasolene—pounds consumed per horse-power hour at rim of wheel.	Foot pounds at rim of wheel per pound of Gasolene.	Cost per horse-power hour, rim of wheel, cts.	Efficiency, H. P. output. H. P. input.	Heaviest pull exerted—Pounds.	Remarks.		
De La Vergne R. M. Co., New York. (Benz motor.)	1	619	37	.70	.71	1.41	.50	3.24	4.63	428,000	9.26		162			
	2	1,000	51.8	1.57	1.40	2.97	.53	4.45	2.83	700,000	5.66					
Duryea Motor Wagon Co., Springfield, Mass. (Own motor.)	1	432	83.8	1.10	.59	1.69	.65	4.01	3.64	345,000	7.28		187			
	2	434	88.5	1.16	.59	1.75	.65	3.78	3.24	623,000	6.48			Trouble with igniter.		
Haynes & Apperson, Kokomo, Ind. (Own motor.)	1	376	23.1	.26	.61	.87	.30	5.78	21.8	91,000	43.60		119	Two cylinders in use, one only supplying power.		
	2	796	39.3	.95	1.28	2.23	.43	5.75	6.04	327,000	12.08					
Lewis, G. W., Chicago, Ill. (Own motor.)	1	353	49.9	.53	.53	1.06	.50	3.29	6.20	319,000	12.40		109			
	2	491	17	.25	.65	.90	.28	3.28	12.8	155,000	25.60			Chain broke.		
Macy, R. H., & Co., New York. (Roger-Benz motor.)	1	521	52.1	.83	1.48	2.31	.36	3.22	3.90	515,000	7.80		103.7			
	2	945	87.2	2.50	2.68	5.18	.48	4.90	1.90	1,010,000	3.92			Belt Slipped.		
Mueller, H., & Sons, Decatur, Ill. (Mueller-Benz motor.)	1	423	92.1	1.18	.61	1.79	.66	3.50	2.96	669,000	5.92					
	2	540	42.3	.69	.77	1.46	.47	3.87	5.60	354,000	11.20					
	3	564	38.6	.66	.81	1.47	.45	3.77	5.71	347,000	11.42		135.4			
	4	984	73.4	2.18	1.57	3.75	.58	3.40	1.57	1,268,000	3.14					
	5	1,168	34.7	1.23	1.86	3.09	.40	4.15	3.37	588,000	6.74					
						Total H. P. developed in motor.		Electrical input H. P.	K. W. hours suppli'd batteries per H. P. H. at rim of wheel	Foot Pounds at rim of wheel per K. W. H.				INPUT. Volts.	INPUT. Amp.	
Morris & Salom, Philadelphia. (Lundell motor.)	1	1,025	25.5	.78	.34	1.12	.70	1.36	1.74	1,138,000	17.4	.57		97	10.5	Test ended by trouble with bearing.
	2	2,015	29	1.78	.68	2.46	.72	2.90	1.03	1,215,000	16.3	.61		96	22.5	
Sturges Electric Motocycle Co., Chicago, Ill. (Lundell motor.)	1	370	41	.41	.21	.62	.66	.99	2.42	818,000	24.2	.41	121	35	21	
	2	890	44	1.14	.39	1.53	.74	1.94	1.70	1,165,000	17.0	.59		69	21	

DETAILS AND DIMENSIONS OF MOTOR VEHICLES.

Vehicle.	Weight (light). Driver, pounds.	Weight (light). Steering, pounds.	Weight (light). Total, pounds.	Wheelbase, inches.	Gauge drivers, inches.	Gauge steering, inches.	Radius compressed. Drivers, inches.	Radius compressed. Steering, inches.	Position of drivers.	Nature of tires.	Nature of bearing.	Fuel or energy supplied.	No. of cylinders.	Diam. bore cylinder, inches.	Stroke of piston, inches.
De La Vergne R. M. Co., New York (Benz motor).	1250	430	1680	66.7	......	......	23.7	18.2	Rear	Solid rubber	Roller	Gasolene	1	5.12	6.62
Duryea Motor Wagon Co., Springfield, Mass. (Own motor).	729	479	1208	57.5	55	53.7	22.8	18.7	Rear	Pneumatic	....	Gasolene	2	4	4.5
Haynes & Apperson, Kokomo, Ind. (Own motor).	829	421	1250	54	55.2	55.5	17.8	17.9	Rear	Pneumatic	Ball	Gasolene	2	4	4
Lewis, G. W., Chicago, Ill. (Own motor).	900	780	1680	46	46.6	46.5	22.9	16.7	Rear	Solid rubber	Roller	Gasolene	1	5	5
Macy, R. H., & Co., New York (Roger-Benz motor).	1440	385	1825	67	52	52	23.8	17.9	Rear	Solid rubber	Roller	Gasolene	1	5	7
Morris & Salom, Philadelphia (Lundell motor).	1260	390	1650	49	44.2	36.1	19.8	14.2	Front	Pneumatic	Ball	Storage battery	Two motors	......	......
Mueller, H., & Sons, Decatur, Ill. (Mueller-Benz motor).	1251	385	1636	73	50.2	47.8	24	18.4	Rear	Solid rubber	Roller	Gasolene	1	5.5	6.25
Sturges Electric Motocycle Co., Chicago, Ill. (Lundell motor).	2085	1450	3535	65	57	57	25.1	23.2	Rear	Solid rubber	Plain	Storage battery	One motor	......	......

TABLE A—WHEEL RESISTANCE TESTS.

Number of test.	Nature of Axles.	Nature of tires.	Mean diam. of bearings. Inches.	Radius of wheels loaded. Inches.	Weight of pair of wheels. Pounds.	Total load, including wheels. Pounds.	Pull at tire due to axle friction. Pounds.	Total pull at tire, producing uniform motion.
1	Collinge	Steel	1⅜	24.5	68	669	5.4	8.84
2	Ball-bearing	Steel	1¾	21.75	....	452	....	2.86
3	Collinge	Solid rubber	1⅛	18.9	75	657	2.64	5.49
4	Ball-bearing	Solid rubber	1$\frac{13}{32}$	24.2	....	645	....	2.36
5	Collinge	Pneumatic (inflated), 1⅞ inches	1⅛	22.5	67	657	1.78	7.37
6	Collinge	Pneumatic (deflated), 1⅞ inches.	1⅛	22.1	67	598	....	10.57

means for driving the wheels independently of each other, as otherwise a binding action on curves would result. The method adopted in almost all the gasolene vehicles presented consisted of some form of differential gear, each driving wheel of the vehicle being separately connected by means of a sprocket chain to the same counter shaft.

WHEEL EXPERIMENTS.

A series of experiments was made with a view to determine the power consumed in wheel resistance, consisting of axle friction and so-called rolling friction, an effort being made to separate these elements with considerable success.

The method adopted in determining the power consumed in wheel resistance was to drive the wheels while resting on a drum of hard wood whose surface was smooth and which was so heavy as to show no perceptible distortion under the loads imposed, the power being measured at the periphery of the drum by the product of its speed and the tension on the dynamometer to which the axle was connected. In this connection it may be noted, as might have been expected from theoretical considerations, that the total dynamometer pull under uniform motion was found constant at all moderate speeds.

In separating the effect of axle friction from that of other losses, observations were made by suspending a load from the axle of a single pair of wheels by a cradle and noting its deflections, which were multiplied by a long pointing arm, making quite a sensitive cradle dynamometer.

The same cradle loads and axle were used with different wheels and by comparing deflections under different circumstances an approximation to friction of direct or vertical bearing and friction of side thrust was obtained.

The analysis of loss due to the action of other parts of the wheel than the axle is only relative and was found by comparing the action of different tires mounted on wheels built up in the same way, having wooden hubs, spokes and fellows.

SEPARATION OF AXLE AND TIRE RESISTANCE.

In the overcoming of axle friction the leverage of the radius of the wheel compared with the radius of the bearing gives a ready method of comparing the values of different mechanical bearings and of lubricants, and in order to appreciate thoroughly the problems involved in wheel resistance, losses due to axle friction must be recognized as separate and distinct from losses due to lack of resilience in the tires and other parts of the wheels. Some writers have assumed that summing axle and resilience losses together under the term "rolling friction" (a hazy term at best) was all that could be done owing to the difficulty of separating the two We believe the method adopted in making the separation to be novel and one indicating a line of future experiment in this direction, which may be of value.

In discarding, then, the term "rolling friction," as indicating a compound action, the losses of power in wheels may result from the following factors:

1. Axle bearing friction.
2. Axle thrust friction.
3. Lack or resilience of tires and other parts of the structure of the wheel.

As noted above, we were unable in the limited range of our experiments to analyze the third factor as we would have liked to have done, and thus the tire determinations involve a possible factor of the resilience of other parts of the wheel. (Resilience is here considered to mean the capacity of an elastic body to store and give out work done upon it.)

Table A gives the actual data and reduced results of the tests. These results may not seem to meet preconceived views, and it may therefore be well to briefly analyze the results in order to indicate what may be deduced from a close consideration of the wheel problem.

ANALYSIS OF WHEEL RESISTANCE.

One naturally seeks an answer to such practical questions as, What kind of a bearing ought I to use? What tire is best suited for certain work? What ought to be the diameter of a wheel for efficient service? And others of like nature. The limits of this report will not permit of more than an indication of the bearing of these experiments upon such questions. The following results may, however, be deduced from a consideration of the above data

Table B—Pulls per 1,000 pounds of total load required to overcome lack of resilience in wheels under examination. (See tests 1, 3, 5 and 6)

5.23 pounds on steel tire.
4.34 pounds on solid rubber tire.
8.5 pounds on pneumatic tires inflated.
14.6 pounds on pneumatic tires deflated.

Let it be noted that these pulls, being due principally to the material of the tire when the rest of the wheel is well made, are not reduced by leverage as in the case of axle friction, as the moment used in overcoming the resistance is the same as the moment of the resistance.

As before mentioned, the axle friction, acting as it does, near the centre of the wheel, is overcome by a pull which is inversely proportional to the radius of the wheel. In order, then, to properly compare axle frictions they should be reduced to pulls at equal distances from the centre of the wheel. Deducing, then, from experiments we have:

Table C—Pulls 1,000 pounds of load on bearings of Collinge axles reduced to uniform radius of 12 inches. (See tests 1, 3 and 5).

18.7 pounds with steel tires.
7.2 pounds with solid rubber tires.
5.7 pounds with pneumatic tires.

HOW TIRES AFFECT RESULTS.

The question is naturally asked: What have the tires to do with the result?

This leads to the consideration of what carriage builders call "set" and "gather" in wheels, both being designed to compensate for the distortion of a vehicle in operation. The "set" is a vertical adjustment of the axle, so that when the wheels are under working load the tread of the tire will be horizontal. The "gather" is a lateral adjustment of the axle, so that when the wheels are under average traction they will be parallel to the direction of motion of the vehicle.

In the case of a steel tire, unless the axle and tire adjustment is perfect, there is induced in the axle a side thrust which accounts for the abnormal axle friction shown above with the steel tired wheels used.

In the cases of the solid rubber and the pneumatic tires the tire allows a more or less perfect adjustment to be taken naturally.

The loads in tests 1, 3 and 5, table A, were practically the same and the axles were identical, and in the matter of axle bearing friction the same co-efficients apply. Thus with the pneumatic tires the co-efficient of 5.7 pounds per thousand at a radius of twelve inches, table C, represents bearing friction and very little, if any, thrust friction.

Reduced to the radius of the bearing the friction figures 120 pounds per 1,000 pounds, giving a co-efficient of friction between surfaces not too well lubricated of 0.12, which corresponds with the result of well-known friction experiments.

The difference between 18.7 pounds on the steel tire wheel and 5.7 pounds on the pneumatic, or 13 pounds, represents the pull per thousand pounds at a radius of 12 inches necessary to overcome the action of side thrust.

Thus the elimination of side thrust is a much greater factor in the reduction of power consumed by the wheels of a vehicle than the reduction of the friction of vertical bearing on the axle.

PROPER DIAMETER OF WHEELS.

In the cases of tests 2 and 4, table A, it was not possible to separate axle friction and resilience, but it seems a fair deduction to draw that with tires eliminating side thrust and with well-designed bearings, the power consumed in such a wheel system is principally due to resilience. This leads to the question of the determination of the proper diameter of wheels. The pull required to overcome axle friction varies inversely as the radius of the wheel. This pull may become so small with proper bearings that even doubling the radius will only reduce it a mere fraction, while reducing the radius one-half will only increase the pull by a trifling amount.

The pull due to resilience does not depend on the radius. Thus economy points to a diameter of wheel, which is not determined by the caprice of the maker or the notion of the purchaser. Elsewhere in this report it will be seen that other elements in the propulsion of a vehicle may outweigh the reduction of pull due to axle friction given by an increased radius of the wheels. The kind of road a wheel is intended to travel over has a bearing upon the subject.

The benefit of the pneumatic tire in reducing the amount of work performed in the driving of a vehicle is treated elsewhere in this report. That it was not found in the friction tests may be disappointing to those who had pre-conveived ideas regarding the matter.

ENERGY EXPENDED IN PROPULSION.

The resistance a vehicle offers to motion may be divided into three principal elements, viz:

1. Kinetic resistance, or that which is common to all mass moved through any given medium.
2. Internal resistance, or that due to the construction of the vehicle itself.
3. Road resistance, or that external resistance due to the nature of the road the vehicle travels over.

The first can be calculated from known laws of kinetics; the second our experiments bear on; the third contains elements for further investigation than it has so far received. In this connection it was intended to have tests made of the resistance due to various road surfaces by measuring the energy input of the electric vehicles competing. The heavy fall of snow at the time of the Thanksgiving Day race interfered with these plans, and an accurate profile of the course showing all grades, nature of paving and roadbed, which had been prepared, was rendered useless for such determinations at that time. It is to be hoped that further experiments will be made along this line to supplement what limited information is now available, and that future promoters of motocycle races will improve such opportunities for adding needed information in this and other directions.

In the following brief analysis of energy expended in the propulsion of a vehicle against the three elements above noted, application of the principles involved to the case of an assumed vehicle may possibly be the best method of making the subject clear. Let us then assume a vehicle as follows:

Weight, 1,600 pounds, divided 1,200 on drivers and 400 on sterling wheels.

Speed to be attained, ten miles per hour, or 880 feet per minute.

Surface exposed to air resistance, 20 square feet.

Elastic tires and ball-bearing axles.

Motor, three horse power; efficiency, 50 per cent.

Taking up, then, the element of kinetic resistance, we divide it as follows:

(*a*) *To give the desired motion to the mass.* To this end a force is required which will be found by dividing the energy of direct motion (found by multiplying the mass in pounds by the square of the velocity in feet per second and dividing by twice the rate of acceleration of gravity) by the distance in which it is desired to accelerate to the required velocity.

The energy of direct motion of the assumed vehicle moving at the rate of ten miles per hour, is, therefore:

$$\frac{1600 \times 14.66^2}{2 \times 32.2} = 5340 \text{ foot pounds.}$$

If it be desired to accelerate to this velocity in a distance of 200 feet, then the applied force must be, for overcoming this element:

$$\frac{5340}{200} = 26.7 \text{ pounds.}$$

Should it be necessary to stop the vehicle in a distance of fifty feet the retarding forces acting upon it, to give this result, would equal a force of

$$\frac{5340}{50} = 106.8 \text{ pounds.}$$

(*b*) *To overcome the component of gravity in climbing a gradient.* For this purpose a force is required which will be found by multiplying the weight of the vehicle by the sine of the inclination of the gradient (approximately the percentage of gradient). Thus our assumed vehicle would require 0.05 of 1600 = 80 pounds force to overcome the component of gravity on a 5 per cent. inclination.

In descending such a gradient a pull of 80 pounds would be exerted by gravity, and if say only 32 pounds were required to keep the vehicle moving at a uniform speed, the brake would have to counteract the difference of 48 pounds, and thus energy would have to be dissipated at the rate of 48 × 880 = 42,240 foot pounds per minute.

Thus in descending a 2 per cent. gradient giving a gravity pull of .02 × 1600 = 32 pounds, no energy is dissipated. In a gradient in excess of 2 per cent., part of the energy of position must be dissipated, by application of the brake, to prevent undue acceleration of the vehicle.

(*c*) *To overcome the resistance of the air.* For this purpose a force varying as the square of the velocity is required, and for moderate velocities this is found approximately per square foot of surface exposed by dividing the square of the velocity in miles per hour by 200. This, for the assumed vehicle, not considering wind, would be

$$\frac{100}{200} = 0.5 \text{ pound per square foot,}$$

and for 20 square feet, the number we assume, we find 20 × 0.5 = 10 pounds pull necessary to overcome air resistance. The work done in overcoming this is wholly dissipated.

INTERNAL RESISTANCE.

Taking up the question of internal resistance, we subdivide it as follows:

(a)—Friction of axle.
(b)—Friction of tire skidding.
(c)—Lack of resilience of tires and other parts of the vehicle.
(d)—Friction of mechanism in self-propelled vehicles.
(e)—Friction of brakes when applied.

These elements have been made the subject of discussion resulting from the experiments made on the various vehicles submitted for test, and are more or less fully treated of in the tests and deductions presented elsewhere in this report.

PULL OF ASSUMED VEHICLE.

In the assumed vehicle we have a power developed at the rims of the driving wheels of 50 per cent. of three horse-power or

$$\frac{33000 \times 3}{2} = 49{,}500 \text{ foot pounds per minute.}$$

At an assumed speed of 10 miles per hour this would give a pull of

$$\frac{49500}{880} = 56.3 \text{ pounds capable of being exerted.}$$

This is the pull actually given out at the rims of the driving wheels and is supplemental to the factor of energy expended in internal mechanism and wheel resistance of drivers. It has to overcome in addition to external resistance the resistance of the steering wheels and other elements of internal resistance not involved between the motor and the rims of the driving wheels. In the assumed vehicle without going into delicate details this would be, say

$$\frac{400 \times 10}{1000} = 4.0 \text{ pounds.}$$

It may be here noted that an excessive "gather" of the wheels will produce a component lateral skidding action of the tires, which may produce quite a large resistance.

ROAD RESISTANCE.

Very little accurate data on road resistance is available, but its elements may be pointed out and deductions made showing how important a factor good roads are in the consideration of economical transportation, whether by means of the motocycle or otherwise.

We subdivide, then, road resistance as follows:

(*a*) *Adhesion of roadbeds to tires.* This is appreciated when moving through wet clay, and there are good reasons for believing that on certain pavements adhesion is quite a factor in resistance.

(*b*) *Distortion or low resilience of the roadbed.* This constitutes a large factor of resistance to the propulsion of a vehicle, as a bad road may offer 10 times the resistance to motion which a smooth one will.

In this connection it was expected to have obtained valuable data from observations made on the electric motocycles and the profile of the course as before mentioned, but as this was impossible, a reference to former experiments determining total traction of wheels on different characters of roads will indicate the relative resistance between different roadbeds.

TRACTION ON ROADS.

The following table is from Molesworth's Pocket Book:

Resistance in pounds per ton (2,240 pounds) on different roads, exclusive of gravity:

Stone tramway	20
Paved roads	33
Macadamized roads	44 to 67
Gravel	130
Soft, sandy and gravel ground	210

Presumably these determinations were made at low speed, so that the element of air resistance may be neglected. The table shows a pull of nine pounds per 1,000 on a stone tramway, which corresponds fairly well to the surface on which our wheel determinations were made. Undoubtedly the axles were of the ordinary type and the tires of steel; thus in this case the resistance was almost wholly that of axle friction and lack of resilience, and corresponds to results under "wheel determinations."

On a macadamized road the pull as given by the table averages 25 pounds per thousand. Thus the difference between this and nine pounds, the result on the stone tramway, or 16 pounds per 1,000, gives the element of road resistance on such a roadbed. Country roads on the basis of this table would probably correspond to the higher figure given for macadamized roads; this is equivalent to 30 pounds per 1,000. Deducting the stone tramway result we have 30 — 9 = 21 as an approximation to the resistance per 1,000 pounds of load which may be expected on common roads.

The assumed vehicle thus would have a constant road resistance to overcome, in addition to other resistances, of

$$\frac{1600 \times 21}{1000} = \text{about 34 pounds}$$

were it fitted with steel tires and ordinary axles. But, as will be seen in the following section (c), the use of pneumatic tires on the rough road might readily reduce this resistance considerably, say to 20 pounds.

ADVANTAGE OF PNEUMATIC TIRES.

(*c*) *Climbing over minor obstructions on a hard road.* This constitutes resistance which, while of short duration in individual cases, becomes an element of considerable importance if such obstructions are frequent. Thus a discussion of this action will make clear the advantage of the pneumatic tire.

Supposing we have a wheel with a steel tire of 24 inches radius, and it encounters a stone one inch in height, then it is evident, unless the stone is crushed or pressed into the tire or roadbed, the load on the wheel will have to be raised over the stone. By a simple calculation it will be seen that this involves the momentary climbing of a gradient of 1 in 3½. In the case of the assumed vehicle with a load of 600 pounds on one driving wheel this would require a pull of

$$\frac{600}{3.5} = 172 \text{ pounds.}$$

This increased momentary pull is overcome by the inertia of the vehicle in motion. To start with such stones in front of the wheels would require perhaps more static pull than the vehicle would be capable of exerting. This is well illustrated when to prevent a vehicle running down hill comparatively small obstructions placed in front of the wheels suffice to accomplish the result (fig 4).

As the vehicle passes over such an obstruction the energy of position is given back partially in energy of motion, but as this is only accomplished by the action of gravity, the element of time is involved to such an extent that if the vehicle no sooner climbs one obstacle than it encounters another, energy is dissipated to a great extent. With a pneumatic tire such an obstacle would sink into the tire half an inch or more, and so reduce the momentary grade in proportion. Where a road is encountered having many such obstructions, the energy saved by the use of pneumatic tires will be considerable, as not only are the momentary gradients less, but energy is stored in the tire by its elasticity normal to the direction of pressure. This must not be confused with the results showing low resilience of a pneumatic tire under tangential pull.

RESISTANCE TO MOTION.

We may now sum the results as deduced from the consideration of the assumed vehicle, as follows:

	Constant.	Incidental.
Kinetic resistance—		
Acceleration	—	26.7
Max. grade, 5 per cent	—	80
Air	10	—
Internal resistance apart from that consumed between motors and drivers	4	—
Road resistance	20	100
Total	34	206.7

We found our assumed motor to be capable of exerting at a speed of 10 miles per hour a pull of 56.3 pounds at the rim of the driving wheels.

Part of the incidental resistance noted above may be expected during the progress of any trip of a vehicle, and if economy is considered it may not be advisable to purchase pull at the expense of speed, but rather to design motors for the specific work they may be called upon to perform.

RESULTS FROM CONSOLATION RACE.

To illustrate this we might cite the run of the Mueller-Benz motocycle in the *Times-Herald* consolation race of Nov. 2, 1895.

The distance traveled was 92 miles over comparatively light grades and ordinary roads, being from Jackson Park, Chicago, to Waukegan and return to Lincoln Park, Chicago. The net running time was 8 hours 44 minutes, and the gasolene consumed 31.52 pounds.

This indicates a speed of 927 feet per minute and a consumption of an average of one pound of gasolene required to run 15,450 feet.

In the tests shown above we found this machine at a speed of 984 feet per minute, and a pull of 73.4 pounds, developed 1,268,000 foot pounds of work at the rim of the driving wheels per pound of gasolene. Again at a speed of 1,168 per minute and a pull of 34.7 pounds it developed only 588,000 foot pounds.

If the above economical development of energy were maintained the average pull throughout the run would be:

$$\frac{1268000}{15450} = 82 \text{ pounds.}$$

If, on the other hand, the latter development of energy be assumed, the average pull would be

$$\frac{588000}{15450} = 38 \text{ pounds.}$$

Undoubtedly something between these two possible developments of energy per pound of gasolene was given.

Within certain limits, therefore, it appears that, with the type of engine used in this machine, resistance to propulsion is not an important factor in economy of fuel, as with more work to be done the fuel develops higher duty. Whether this be an argument for or against the engine is a question treated in another part of this report.

ECONOMICS.

The economics of the motocycle is a broad subject, and it does not come within the province of this report to do more than touch on economy of consumption and use of gasolene as fuel.

A disregard of fuel consumption under the plea that gasolene is a cheap commodity must be considered unwarranted when it is realized that a capitalization of an extra amount expended for gasolene would justify a higher price to be paid for a vehicle more efficient in transferring the energy of the gasolene into propelling energy. An important factor in economy of fuel consumption is involved in control by changing the mixture of air and gasolene. It is evident that, given two vehicles possessing equal merits as regards their control, then the one accomplishing certain results with the least cost of operation represents a lower annual cost of operation than the other, and consequently a justifiable higher first cost. Aside from the actual cost of an increased amount of fuel, the disadvantages of handling or storing it is a matter for consideration, particularly if the more volatile petroleum products are used and the question of underwriters' restrictions is considered.

USE OF GASOLENE.

For the following notes bearing on the use of gasolene we are indebted to Samuel Rodman, Jr., explosive expert.

Gasolene is the lightest volatile product commonly obtained from the distillation of crude petroleum. Specific gravity, .660 to .690; boiling point, 158° F. to 194° F.

Naphtha is a lower product. Specific gravity, .690 to .700; boiling point, 175° F. to 230° F.

Benzene is a still lower product. Specific gravity, .730 to .760; boiling point, 248° F. to 302° F.

Petroleum, generally known as kerosene, is graded by flashing tests which run from 110° F. to 260° F. and over. Its specific gravity varies from about .82 to about .86.

All volatilize more or less readily, giving off hydrocarbon vapors, which, uniting with air, form explosive mixtures.

Careful investigations have been made with a view of regulating the storage and transportation of hydrocarbon oils. In the case of petroleum it has been determined that one volume of petroleum vapor renders 380 volumes of air explosive and 1,150 volumes inflammable. A red-hot piece of metal or coal, or a spark from steel or flint will not ignite an explosive atmosphere of petroleum vapor, but white-hot metal, flame or electric spark will readily do so. Naphtha exposed to an atmospheric pressure of 30 inches, at a temperature of 70° F., evaporates at the rate of about 0.09 pound per square foot per hour.

Many accidents are recorded from explosions of hydrocarbon vapors mixed with air. In the majority of those that have come under notice vapors of hydrocarbons have escaped into the air through some leak in the receptacle or pipe holding them, and explosion has occurred on the approach of a naked flame.

In closing this report we desire to acknowledge valuable services and assistance in conducting the tests as follows:

Our thanks are due to Messrs. Samuel Rodman and C. L. Brown for assistance at the tests and subsequently in figuring out results. For special wheels prepared for test we are indebted to the Hartford Rubber Company for those having pneumatic tires, to the Rubber Tire Wheel Company, of Springfield, O., for those having solid rubber tires, and to the Staver & Abbott Co., of Chicago, for those having steel tires. Through the courtesy of Mr. Frem, Messrs. Fairbanks, Morse & Co., of Chicago, furnished delicate scales for use in dynamometer work, and Mr. Ludlow, of the Crosby Steam Gauge and Valve Company, furnished the speed indicators used.

JOHN P. BARRETT,
Chairman of Committee.

L. L. SUMMERS,
JOHN LUNDIE,
Engineers of Tests.

To Tour the West with a Brand New Attraction.

N. B. Thearle, an amusement manager of Chicago, is arranging to make a tour of the West, beginning about May 1, with the object of exhibiting in towns along the route as complete an assortment of the present types of motor vehicles as he can assemble. He proposes to herald his approach by the most approved theatrical methods, using a special car for the transportation of his attractions, and devoting one day to each town.

He hopes to cover from four to six towns each week, and when his coming is coincident with country fairs, to have special motor vehicle days set apart in honor of his arrival.

ENGLISH INTEREST.

Two Motor Exhibits, and the Prince of Wales a Patron—Organization of the Motor Car Club.

An International Exhibition of motor carriages will be held at the Imperial Institute, London, beginning early in May and lasting through the entire summer. It has received the approval of H. R. H. the Prince of Wales, and will doubtless attract wide public interest. The exhibits will comprise motor cycles and carriages, as well as motors and motor plants of every description. Motor carriages will be shown in operation daily, and previous to the exhibition one or two receptions will be given at the Institute by the Motor Car Club, to the members of the House of Lords and Commons, in order to afford the legislators an opportunity of viewing and testing the new vehicles, and thus paving the way for intelligent action in removing the restrictive act which now prohibits the use of motor carriages on common roads.

The Directors of the Crystal Palace have also decided to hold during May and June an exhibition of every description of vehicle, from the historical stage and state coach to the latest development of motor vehicle, the latter being exhibited in motion in the grounds. The exhibition will also include all new inventions connected with carriages and harness. The Lord Mayor, who is Master of the Coachmakers' Company, has accepted the Presidency of the Honorary Council of Advice, which will include Sir Frederick Bramwell, Sir David Salomons, Sir Henry Trueman Wood, and Mr. John Philipson, President of the Institute of British Carriage Manufacturers.

In January issues of the *Autocar*, the English motor journal, Sir David Salomons writes on "Self-Propelled Carriages." American inventors will be surprised to hear that the learned gentleman believes that steam is the coming power for motor carriages, regarding the Serpollet vehicles as the most perfect at the present time. He prefers wooden wheels, iron tires, ordinary bearings and the fifth wheel. The reason he assigns for preferring the latter—that a horse can easily be attached to the vehicle in case of accident—raises the question whether Sir David's ideal is not more of a horse vehicle than a motor vehicle.

An organization called the Motor Car Club has been formed in London to promote the cause of the motor vehicle.

The club is formed on the proprietor system, and registered as a Limited Liability Company, but as the Directorate or Board of Management receive no honorarium, and are purely honorary officials, the shareholders and members will receive no dividends.

Its sole object is to further the interest of the whole motor carriage movement, the coming great industry, in every description. It will have one president, ten vice-presidents, and a committee or an executive council of not exceeding 20 members, whose names will soon be given to the public.

The immediate object of the Motor Car Club will be to undertake all such steps as will speedily bring about alterations in the existing restrictive law with regard to the use of motor carriages on common roads. It is clearly understood that this club is not formed for any trade purposes whatever, for its main objects are, to hold exhibitions, arrange competitions, give prizes, and to generally protect, control, and further the motor carriage movement.

The Prince of Wales has purchased a petroleum launch.

◆

PARIS NOTES.

The Paris-Marseilles-Paris Race.

The Committee of the Automobile Club authorized to report arrangements for the race from Paris to Marseilles and return has decided upon the main regulations which will govern that event.

The race will be run some time in June from Paris to Marseilles and return. The contestants will be allowed to proceed only by daytime, and the daily stent will be from 85 to 125 miles.

Competing vehicles will be divided into two classes; vehicles for two or four passengers, and those accommodating a greater number of passengers.

Any member of the club can become a member of the committee of the race on payment of the sum of $200.

The commission has decided to give a number of special medals to manufacturers and operators of vehicles who acquit themselves with merit in the contest.

The committee has decided to have a special course of about 60 miles for motor cycles, tricycles and quadricycles that do not exceed 300 pounds in weight.

A company called the Compagnie Francaise des Voitures Automobiles has been organized in Paris to introduce a motor cab service throughout the French capital. These cabs, which will be propelled by petroleum motors of 4½ horse-power, will seat three passengers, and will be warmed in winter by the exhaust and the water used in cooling the cylinders.

De Dion, Bouton & Co., of Paris, are building six steam vehicles, of a capacity of 35 horse-power each.

A motor vehicle exhibition will be held at Brussels, Belgium, about the middle of April.

The Automobile Club of Paris now has 500 members.

An exhibition of bicycles and motor vehicles will be held at Nantes, France, on the 8th of March.

Paris has another journal devoted to automobilism—*La France Automobile*—a weekly, the first number of which was issued on Feb. 1.

◆

The "Pygmee" Motors and the Automobile "Leo."

One of the new types of motor vehicle exhibited at the recent Salon du Cycle, at Paris, was the Automobile Leo, manufactured by Leon Lefebvre, 4 Rue Communes, Paris, France.

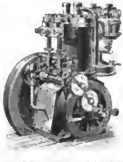
The motor which furnishes the power is specially designed for vehicles, and is called the "Pygmee," referring to its comparatively small size. It is said to be perfectly balanced, and to operate equally well in either the vertical or the horizontal position. Two cylinders are employed, which may be separately controlled

Either kerosene or gasolene may be used as fuel, the former with a special carburetor, which is claimed to overcome the difficulties frequently experienced in keeping the cylinders clean.

The six-horse motor is said to make 700 revolutions, and stands about two feet high. This and the three-horse motor "Pygmee" are designed especially for vehicles.

The weight of the three-horse motor is about 180 pounds, and that of the six-horse about 300.

The Automobile "Leo," illustrated here, was named from its constructor, and was exhibited for the first time at the Salon du Cycle, where it excited much favorable comment on account of superior workmanship and elegant finish.



PYGMEE CARRIAGE MOTOR.

The vehicle, which resembles a hunting trap in general style, is brilliantly painted in black and yellow.

All the mechanism, including the six-horse Pygmee motor, is concealed from view in the body of the vehicle. The power is transmitted by means of gears, without chains. Michelin pneumatics are fitted to the wheels, and the carriage work shows the master hand of the house of Ehrler-Jeantaud, one of the foremost Parisian carriage builders, who have given much attention to the motor question for several years.

The price of the vehicle is $2,000.

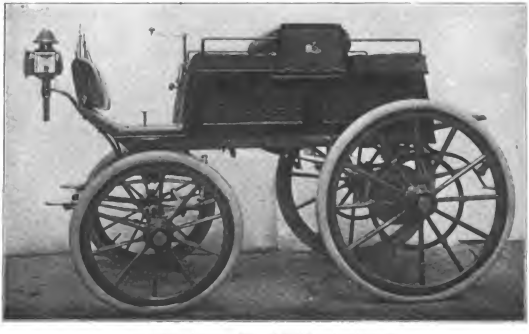
Design of a Turbine Gas Motor.

BY HARRY E. DEY.

It is an undisputed fact, I believe, that the electric carriage is the ideal vehicle for general use, its only drawback being the limited distance which it can travel on one charge, and the time that it takes to recharge in case a person desires to continue further than the first charge will take him. Wishing to eliminate the objections (imaginary and otherwise), I set myself to devise a small, cheap motor that may be used at home to charge the batteries, and, when going off on long tours, may be taken along and kept steadily running, charging the battery constantly. It need not be of more than one-horse power, while a direct acting one would require to be of about six, for the batteries and motor, with a liquid gear, will meet any emergency that can possibly arise. I have invented and designed such a motor, which will not weigh over 15 pounds for a one-horse machine, and in sizes from five-horse up will probably not exceed five pounds per horse-power. To do this I have had to take a very radical departure from previous practice.

I took into consideration the fact that speed is power, and realized that to make a light small engine I must have a very high speed. This would be impossible with the reciprocating type. The common rotary has always been a failure with steam, why should it act differently with gas? I then thought of the turbine, and concluded to adopt that, as it has been a pronounced success with steam.

In the annexed drawings, Fig. 1 is a sectional plan view; Fig. 2, a section through *C*, *D*, and Fig. 3 a section through *A*, *B*. This design is made more as an experimental motor. It is expected to deliver between one and two horse-power on ordinary illuminating gas, and a proportionately larger power on gasolene, kerosene or acetylene. It will be particularly advantageous on the latter because of the large expansion permissible.



AUTOMOBILE LEO. LEON LEFEBVRE, PARIS, FRANCE.

E is a funnel-shaped cylinder in which the shaft F with its blades *GGGGG* and *HHH* revolves. The blades *GGGGGG* are all set at an angle similar to the blades of a propeller. The blades *HHH* are straight at the right-hand side and gradually change to an angle, the reason of which will be seen later. I is a revolving explosion chamber, turning on the shaft J. As will be seen, there are six compartments in which the explosions successively take place. This explosion cylinder is made to revolve by the backward kick of the explosion, the outlet being on an angle, the normal number of revolutions being about 200 per minute, making 1,200 explosions per minute. This allows the chambers to be made very small. The compression takes place in the rotary compressor, shown in section in Fig. 3, an inspection of which will show the manner of operating. This compresses the air only, the gas being picked up later. The gas and air mixture enters the explosion chamber through the pipe K and port K2 about 90 degrees before ignition. It is ignited about 90 degrees before reaching the liberating port L, so that it will reach its maximum pressure before reaching the blades. After passing the port *L* the chamber exhausts its residual charge to the atmosphere, simultaneously receiving a very fine jet of water, which is immediately converted into steam, driving out the dead gas completely, cooling the chamber by evaporation, and leaving a vapor which will cause a very high pressure when the next explosion takes place. A connection between the air reservoir and the top of the water tank will keep up a pressure upon the water. *M* is the water pipe.

The bearing at the right-hand side is a plain pivot point, but at the other end the shaft is held between three pulleys, which act as a roller bearing and also as a friction gear to drive the air compressor, and, if desired, a thin belt may be placed around them for transmitting the power, for the circumferential speed of all is the same. A rubber hose is slipped over the end of the shaft to give a better frictional surface. I propose in some cases to attach directly on the main shaft a disc dynamo, which, at 30,000 revolutions, ought to give at least 25 volts, a very desirable voltage for a carriage. The cost of such a machine would be a mere song.

The inflamed gas when leaving the explosion chamber passes through the port *L*, and strikes broadside against the blades *H H H*, causing them to revolve the shaft, the gas being at the same time forced to the left, where it acts against the angular part of the blades, which in turn impart to the gas a rotary motion. This rotary motion is rectified by the stationary straight blades *N*, after which it again strikes against a set of propellor blades, larger than the first set, the increase of area being entirely between the two ends of the propeller. This gives the same results as a multiple expansion engine, without steps between the expansions. In the present motor the area of the outer blades is 50 times that of the inner ones.

The dimensions of the motor are: Base, 7½ x 18 inches; height, 6½ inches. Some of its advantages are extreme lightness, high efficiency, low cost, easy starting (turn the induction coil switch and give the explosion cylinder a spin), continuous exhaust at very low pressure, varying the speeds and power between wide limits by varying the number of explosions, which is done by controlling the revolutions of the explosion cylinder, its revolutions being entirely independent of those of the main shaft.

I do not propose to confine the use of this motor to the field for which it was designed, for it will do the work of any other gas engine better and cheaper, and at a less first cost. It may be used on carriages without the electrical equipment proposed, but I have an abiding faith in the future of the electric vehicle.

The same principle of construction could be used for a steam or any other expansion engine.

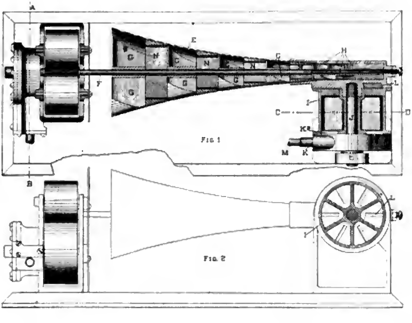


FIG. 1

FIG. 2

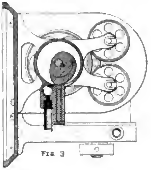


FIG. 3

DESIGN OF TURBINE GAS MOTOR HARRY E. DEY, NEW YORK.

REPRESENTATIVE OPINION ON THE COSMOPOLITAN RACE.

The editor of THE HORSELESS AGE, believing in the adage that in many minds there is wisdom, requested a number of the leading inventors and promoters in the motor line to give their opinions of the *Cosmopolitan* race. These opinions, which show a singular unanimity, are appended.

Charles E. Duryea on the Speed Craze.

Editor Horseless Age:

PEORIA, ILL., Jan. 31, 1896.

DEAR SIR:—You have doubtless noticed in the February *Cosmopolitan* that they offer prizes for a contest to be held on Decoration Day, over streets and roads from City Hall Park, New York, to Irvington and return. You will also notice that they state the awards will be made on points as follows:

Speed	50
Construction	25
Operation	15
Cost	10

It seems to the writer that this is offering a premium for speed, whereas the crying need of to-day is not speed, but better construction and better operation, and possibly, to suit the desires of the masses, less cost. The fact that the winning wagon on Nov. 28 made 7½ miles per hour over roads far too bad to permit any such speed for horse flesh, indicates that the speed of the present motor vehicle is already up to the legal limit allowed in cities, and up to or nearly to as high a limit as safety will permit, even in the country. To run a speed contest over a crowded city course when the roads will permit high speed is simply inviting accident, and the man who is the biggest dare-devil and most willing to commit murder in order to make speed, stands the best chance of winning such a speed contest. Happily the bad condition of the weather prevented any dangerous speeds at Chicago, but this is not likely to be the case in New York next Decoration Day, and so the percentage to be gained by high speed should be decreased, and the speed itself limited to some given miles per hour, which miles per hour should conform with the city regulations, and in the country be slow enough to not be an element of danger.

There will, undoubtedly, be speed contests in the future, but we should insist that they be made on race tracks, if in the city, or across the country, where the danger of running over people is not so great.

The two items of construction and operation deserve much more prominence, because these are the two things that have been greatly lacking in the past. There are many makes of traction engines for farm use which have speed enough to suit the average requirements, but they have been too complicated in construction to make them worthy of consideration as a driving vehicle by the public, and a number of the present attempts at self-moving vehicles are open, to a less extent, to the same objections. We require in the horseless carriage a mechanism so simple as not to get out of order easily or give trouble to the unskilled operator, and a carriage so arranged as to be comfortable in use, viz., it should be clean, free from objectionable odor, vibration or possible danger. If it is simple in construction it will, in all probability, become cheap in cost, when the supply approximates the demand, so the item of cost is not a large one if the item of construction is given proper prominence.

The writer, as an officer of the American Motor League, would be much pleased to hear from friends of the motor vehicle, whether manufacturers or not, on this question of points for awards, and would be pleased to hear from any one, as soon as possible, with their views on the matter. It is the intention of the officers of the League to formulate a system of rules for governing such contests, and it is hoped to make such rules acceptable to the promoters of such contests, the competitors therein, and the spectators thereof, and that this may be a success the hearty co-operation of all interested is by this letter invited. Replies may be addressed either to the writer, at Peoria, Ill., or to the office of the American Motor League, 335 Dearborn Street, Chicago, Ill.

Yours truly, CHAS. E. DURYEA,
Pres. Am. Motor League.

A New Code for the Judges.

DETROIT, MICH., Feb. 12, 1896.

Editor Horseless Age.

DEAR SIR:—The division of points in the *Cosmopolitan* contest seems certainly open to criticism. The motor-carriage has to day a speed greater than that attained by horses, and that 50 points should be awarded for speed seems unfair. This division of points has a tendency to produce a racing machine and crowd out features that possess more merit. The following division of points is recommended, and in the order of their importance:

15	Safety.
15	Comfort.
15	Simplicity.
15	Speed.
10	Manageability.
10	Range of Utility.
10	Cost of Operation and Maintenance.
10	Appearance.
100	

In relation to the speed, it is suggested that five points be allowed for the run to Irvington and return, and that the remaining 10 points be awarded for the best run of one hour made upon a race track.

It now remains for some liberal-minded individuals to follow the good example of the *Chicago Times-Herald* and the *Cosmopolitan Magazine*, and inaugurate a long-distance contest. Such a contest would show the possibilities of these vehicles for extended travel, and would do much toward better roads.

Yours truly,
CHARLES B. KING.

P. S.—The writer is indebted to Mr. C. E. Duryea for some of the headings used in the above list. C. B. K.

Speed Cuts Too Much of a Figure.

Editor Horseless Age.

DEAR SIR:—Your favor of the 30th ult., in relation to *Cosmopolitan* race, received. We think the programme is satisfactory with one exception, that the speed in the race will cut too much figure with the prizes. The speed is 50 per cent. It seems to us that it should be required that a motocycle should make a certain rate of speed, but if they exceed that rate it would not make the carriage which exceeds any more liable to win the race than a carriage which would make the required speed. One carriage may be practical for all purposes and still not be able to win the race, whereas, another carriage may win the race and still not be practical for ordinary purposes.

Thanking you very much for the interest you have taken in our motocycle, we remain, Yours very truly,

H. Mueller Mfg. Co.

Favors the "Scorcher" Too Much.

Feb. 17, 1896.

Editor Horseless Age.

Dear Sir:—Replying to yours of the 15th inst., asking for our views of the *Cosmopolitan* race, we wish to say that taking into account the shortness of the course to be run, and the large number of points (50) to be credited for speed, we look upon the race as being designed for electric rather than for vapor motor vehicles. In a test of this nature it would seem that simplicity, efficiency, economy, weight and *endurance* should all take precedence over speed.

In the development of the motor vehicle, speed beyond that made now by an average driving team should be the last factor sought, and we think we are safe in saying that a race in which so many points are given to the "Scorcher" will appeal but lightly to the experimenter whose aim is to build a general purpose horseless vehicle.

The racer will be developed later, and will be regulated by laws such as are in force to-day governing fast driving.

Yours truly, American Motor Company.

Too Short—Too Crowded—Too Many Points for Speed.

New Brighton, Pa.

Editor Horseless Age.

Dear Sir:—You ask me what I think of the *Cosmopolitan* race. I should be more pleased with it if the course were extended to include some rough country road. The public have the mistaken impression that a motor carriage cannot go over all kinds of roads, but must be limited to smooth Summer roads and city pavements. It was pretty well proven in Chicago, Nov. 28, that this view is an error, but I should like to see a demonstration that would satisfy all.

When I was testing Dr. Booth's motor carriage here this Winter the first questions asked were: "Can it go up a hill?" "It won't go in mud, will it?" etc. Hence, to satisfy them, I took the steepest hills and the worst mud I could find.

I believe races should be arranged to put the machines to extreme tests. A little further up in your State is a country suitable for such tests, if my geographical knowledge is not at fault.

At any rate, I think the course too short. The highest percentage is for speed, and if all strive for that along such a crowded course it would be rather dangerous. A longer run up the Hudson would be better for speed also.

The time for the race is ideal, and the promoter of it may have reasons for selecting the route which I know nothing of, but I wish he would reconsider it.

Yours sincerely, W. Lee Crouch.

J. Frank Duryea.

In nearly all accounts of the Duryea motor wagon which have thus far appeared, the name of Charles E. Duryea has been mentioned as the sole inventor, while the very important part performed by his younger brother, J. Frank Duryea, in the development of the machine, has been lost sight of. As the motor in its present form is the work of the younger brother, it is fitting that a few facts should be given about his life and his mechanical education.

J. Frank Duryea was born in Illinois, in the year 1869. Having a taste for mechanics he came East to obtain a practical knowledge thereof. His first experience was gained in a bicycle shop at Washington, D. C. Later he studied tool making and machine construction in shops in New Jersey and Massachusetts.

J. FRANK DURYEA.

In the Spring of 1892, at the solicitation of his brother, Charles E. Duryea, he took up the subject of the motor-vehicle, and worked on it in collaboration with his brother. When, a short time afterward, Charles E. was called West on other business the younger brother found himself facing the motor problem alone. He buckled to it with energy and perseverance, and after three years' experimenting perfected the motor which is so successfully employed in the Duryea wagons, the strong points of which are reliability, wide range of speed and ease of starting

Mr. Duryea's conception of the motor-vehicle of the future is one in which no mechanism is exposed, and the wheels are unencumbered by gears or chains, which collect the dust and dirt of the road. He is the mechanical superintendent of the Duryea Motor Wagon Company.

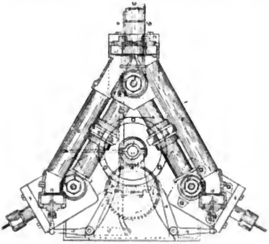
The Horseless Age is covering its field well, and focusing attention upon the motor question.—*Syracuse Herald.*

Harvey S. Bristol's Motor and Vehicle.

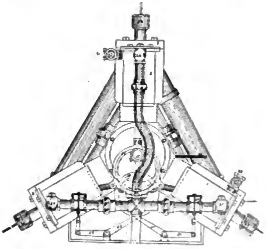
The accompanying drawings represent a new motor and vehicle recently patented by Harvey S. Bristol, Chicago, Ill.

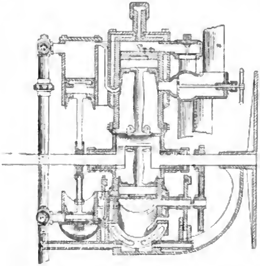
In this motor an explosion is obtained in each cylinder at every revolution in the following manner:

The valves 7, 8 and 9 are open, and with the lever 36 the pinion 18 is thrown out of clutch, so as to allow the motor shaft 37 to revolve without working pinion 18 and shaft 20, and allowing the levers 16, 17, 23 and 24 to remain still, and the valves 10, 12 and 13 to remain closed. Hence the exhaust from the cylinders 4, 5 and 6 passes through the valves 7, 8 and 9 into the atmosphere.



To make an explosion in each of the bottom cylinders 4 and 6 and exhaust in cylinder No. 5, it is necessary with lever 3, 6 to throw the pinion 18 into the clutch working the lug wheels 21 and 22, which works the lever 16 and 17 and 23 and 24. Thus the valve 7 and 9 is closed and the cock 38 to compressor is opened, which allows the compressor to work air in and out of the cock 38. Now, as the compressor No. 1 takes in its charge of gas and puts it into cylinder No. 4, the piston coming down compresses it and ignition takes place, driving the piston upward, and when at the end of its stroke the lug and the wheel 21 comes in contact with the lever 16 and opens the valve 10, allowing the exhaust to pass through the pipe 14 and through the valve 11 into the cylinder 5, and when the piston in cylinder 5 gets to the lowest end of its stroke, and exhausts out through the valve 8 and into the exhaust pipe 38, then the valve 10 remains open until the piston in cylinder 6 gets to the lowest end of its stroke, allowing all the vitalized gases to be forced through the pipe 14 into cylinder 5. Cylinder No. 4 is a repetition of cylinder No. 6; therefore we have an explosion in No. 4 at one revolution and in No. 6 the next, and both exhausting into cylinder 5, and causing cylinder 5 to work every revolution. Then the compressors will work gas one revolution and air the next, taking it through valves 25 and 26, and as cool air goes into the warm cylinder the benefit of the expansion of air for working the cylinders every other revolution is obtained. The levers 23 and 24 and the valves 25 and 26 are worked the same as levers 16 and 17 and valves 10, 12 and 13, from the lug wheel 22.





To change the exhaust or work the motor from cylinder 4 to 5 and from 5 to 6 and from 6 to open air, we proceed as follows:

The pinion 18 is allowed to remain in clutch, the valve 9 is opened, and while the valves 7 and 8 remain closed and the cocks 30 and 31 open. After an explosion has taken place in cylinder 6 and the piston has made its upward stroke, the valve 10 is opened by the lever 16, the gear-wheel 19 allowing the exhaust to pass out through the pipe 14, and driving the piston downward in the cylinder 5. When the piston in cylinder 5 has completed its downward stroke, the lug on the lug wheel 21 comes in contact with lever 17, causing the valves 12 and 13 to open, allowing the exhaust to pass from cylinder 5 through the pipe 15 and valve 13 into cylinder 4, driving that piston upward and exhausting out through the valve 9 and passing out exhaust pipe 38. It will be seen that the compressors 1 and 2 are working air through the cocks 30 and 31, while the compressor 3 on cylinder 6 is working gas at one stroke and air the next, which is drawn through valve 26, therefore giving the cylinder a charge of gas at one stroke and air the next. It will be seen

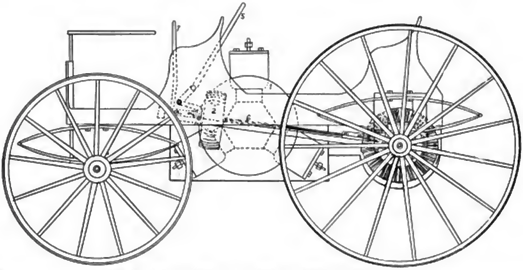


DIAGRAM OF MOTOR WAGON. HARVEY S. BRISTOL, CHICAGO, ILL.

that when there is an explosion in 4 and 6 and an exhaust into 5, or an explosion in 6 and an exhaust through 5 and 4, the valves 10, 12 and 13 will all remain open until the pistons have completed their outward strokes.

The estimated weight of a six-hp motor for a road vehicle is 250 pounds, vehicle and all 850 pounds.

The vehicle shown in cut is described as follows:

No. 1. Fly and friction wheel combined on motor shaft.

No. 2. Friction wheel that intersects No. 1.

No. 3. Pinion wheel on shaft with No. 2.

No. 4. Bevel wheel on shaft of hind wheels of the carriage.

No. 5. Lever that throws friction wheel No. 2 backward and forward for speed required on shaft No. 6, and when thrown past the centre of wheel No. 1 allows the carriage to back up as the motor runs one way all the time.

No. 7 is for working friction wheel No. 2 against friction wheel No. 1, and also for throwing it away from wheel No. 1 and against a break board which acts as a break for the carriage.

The gasolene tank is a carbureter situated under the rear seat, while the water tank and the battery are situated under the forward seat. The dynamo for restoring the battery is driven by wheel No. 1, and there is also a small rotary pump for circulating the water around the cylinders. The front wheels work on a pivot close to the hub.

* * *

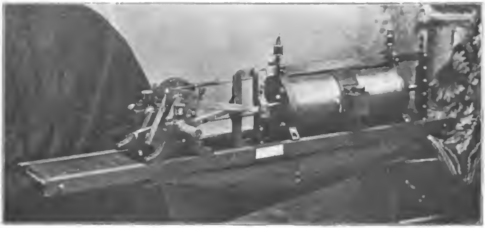
The American Vehicle Motor.

This new motor, which was mentioned in the last issue of THE HORSELESS AGE, is the invention of F. M. Underwood, of Bucyrus, O.

It has one cylinder, two pistons, and a double crank, the pistons, crank and connecting rods acting as a balance.

The mixture is fired between the two pistons, thus causing them to move in opposite directions. While one pushes directly on one connecting rod, the other pulls on the opposite connecting rod. Thus it will be seen that there are no strains between the cylinder and the main boxing, and that a small balance wheel only is required to bring the motor up to normal speed.

As there are no cylinder heads to be acted upon and the pressure is equal on both pistons vibration is so reduced that when at normal speed this motor is said to show no more vibration than an ordinary sewing machine.



AMERICAN VEHICLE MOTOR. F M. UNDERWOOD, BUCYRUS, O.

The piston travels twice the length of its stroke, that is to say, a motor having a six-inch stroke has a twelve-inch piston travel. In this manner the inventor claims to derive more power from a given bore and stroke, the exhaust is lighter and the speed much greater because the force is used twice the length of the stroke.

This motor will be built expressly for vehicles in sizes from one to six horse-power. The three to four horse motor will weigh about 120 pounds.

Several motors may be coupled together in a series, using but one fly-wheel.

Oil Motor of C. W. West

C. W. West, a civil and mechanical engineer of Halifax, N. S., has just perfected an oil motor, which is specially designed for wagons and launches (See page 24.)

It works on the four-cycle system, and the cylinders are cooled by water, circulated by gravitation.

The oil tank is placed on a level with the vaporizer, and from this tank a supply pipe is led to a small oil vessel (not shown in drawing). The supply of oil from this vessel to the vaporizer is regulated by a graduated valve (not shown). A jet of air is at the same time admitted into the small upper hole, shown in the vaporizer on the back of the motor, which breaks up the oil at entrance into fine particles, as shown in drawing No. 2. A graduated valve fitted to the large hole in the vaporizer, allows a second admission of air, rendering the mixture explosive as it passes through the vaporizer.

At this point one of the pistons is about to make an outward stroke, and one of the admission valves opens, and as the piston travels out it draws in a full charge of the explosive gas from the vaporizer through this valve.

This engine, though similar in many respects to those already described, has some very important points of difference; it is precisely similar in so far as it works on the well-known four-cycle system, and in having its cylinder and explosion chamber surrounded by a water jacket, the water being circulated by gravitation.

But in almost every other point it differs from those already described in this magazine, every part of it being in view and easy of access; the oil tank is placed anywhere on a level with vaporizer; from this tank a supply pipe is led to a small oil vessel (not shown on drawing); the supply of oil from this vessel to the vaporizer on back of engine shown on drawing is regulated by a graduated valve, not shown—a jet of air is at the same time admitted in upper small hole shown in vaporizer on back of engine.

When the piston gets to the end of its stroke, the valves close, and the piston returns and compresses its charge. Having arrived at the end of its compression stroke, the charge is fired by an electric spark. In the igniting device the primary wires are attached to a brass fork, the contact being made by a brass ball passing between the fingers of the fork at the proper moment. The secondary wires are connected to the ignition plug. This plug is made of brass, and the wires, in passing through, are insulated. A third graduated air valve is placed in the supply pipe to the cylinder to allow the admission of an extra supply of air after the motor has been started. This makes a richer gas and thus economizes oil.

All of the air and oil admissions are under separate and perfect control, so that any change of temperature or atmospheric conditions can at once be compensated for by regulating the supply of air. The inventor regards this as a very important point in an oil motor, where the quantity of air requisite to form with the oil vapor an explosive mixture, depends very much upon the temperature and other atmospheric conditions.

No force pumps are employed; indeed, no pumps at all, which Mr. West believes is a step in the right direction, as casualties have occurred from oil tanks bursting under pressure from these pumps; all of the air and oil in the West motor is drawn from the tank through the vaporizer and valves by the piston on its outward stroke.

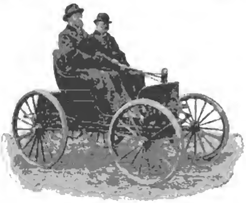
For stationary purposes or launches, instead of an electric igniter the charge is to be fired by a hot porcelain tube, with the addition of a timing valve worked from its own cam, and opened only at the proper time to ensure the explosion taking place at the right moment, just after the crank has got over the dead centre. This obviates any trouble or uncertainty in the starting of the engine. The reason for using the electric igniter on the wagon motor is that the lamp for heating the igniting tube would be affected by winds and by the cold current of air due to high speeds.

In starting this motor the vaporizer is warmed up by the lamps, and after a few turns of the shaft, the valves admitting oil and air having been opened, the piston draws in a charge, compresses it, it is fired and explodes and the engine is started. This can be done in from 6 to 15 minutes, according to the temperature.

Duryea Model for 1896.

The new model of the Duryea motor-wagon, just completed, shows a number of new features.

The frame work is of angle steel. The vehicle is built low, and the reach or distance between the axles is greater, giving greater stability.



Other changes noticeable are the 2½-inch pneumatics, instead of the 2-inch, the curved lines in the seat, which are in pleasing harmony with the curved dash, and the excellent springs, which supplementing the pneumatics, make riding very easy.

The power of the motors has also been increased, but in other respects the tried and proved features of this wagon remain the same. It will soon be exhibited in New York.

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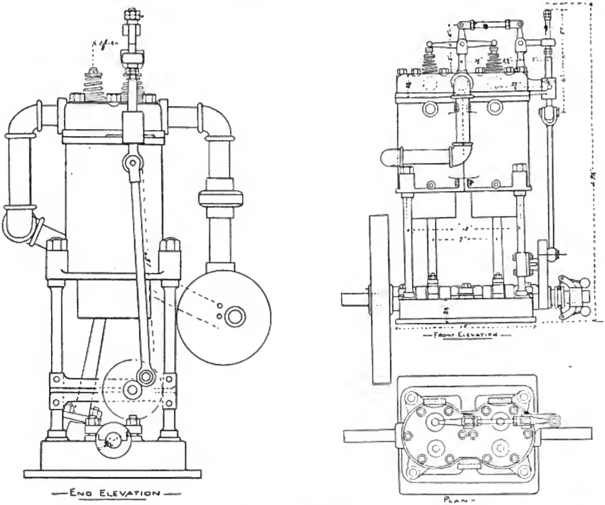
An exhibition of aeronautical machines of all kinds will be held near Boston, late next Fall, under the auspices of the Boston Aeronautical Society. It is expected that a number of motor machines will be shown.



C. W. WEST OIL MOTOR.

Vehicle Motors.

BY CHARLES B. KING.

Since all progressive minds are now turning their attention to the motor-carriage, it is well to go beneath the surface and consider some points in connection with hydrocarbon motors and their performance when placed upon vehicles for traffic upon the highway.

It must be borne in mind than when a motor is placed upon a vehicle its conditions are changed and all its points must be studied with the motor working under its new and sometimes trying conditions. The motor-carriage may run beneath the burning rays of a summer sun, or travel over the frozen roads with the temperature below zero, or again may climb muddy hills, or drive through a rainstorm to its destination. The earnest worker considers all of these conditions, and, as a result, he has produced to-day practical motors and motor vehicles. These vehicles are not available in large numbers as yet, because our shops have not been fully equipped for their manufacture.

In comparing the upright and horizontal motor, we will first take up the former type.

The upright motor has many disadvantages, and these are especially noticeable when we contemplate the coming type of carriage with small wheels and low centre of gravity. The motor cannot be conveniently placed beneath the seat because the base of the motor will be brought in dangerous proximity to the road-bed. It cannot be removed to any other part of the vehicle without disfiguring the general appearance. The self-circulation of water is seriously hindered in this form of motor, as it is usually found impossible to place the water tank above the cylinder. A pump is in this case added, and as we all know that pumps sometimes refuse to handle hot water, such an arrangement is thus rendered unreliable and uncertain. The upright motor has the disadvantage of the reciprocating parts working up and down upon the vehicle springs, and even if the motor is supposed to be in perfect balance, a vibration is always noticed when this motor is in operation.

The horizontal motor has many advantages, and, all things considered, it will probably be the coming type, and will hold its own until something better takes its place. This motor should be placed fore and aft in order to subject the vehicle to the least vibration. If the motor is placed with the cylinders parallel to the axles, the pulsations of the motor tend to rock the vehicle. There is always some side play in the wheel-fit or the axle, and this vibration has here a further opportunity to become aggravated. Two cylinders are strongly recommended, because in case of an accident to one cylinder, the other remains intact to bring the carriage to its destination. Three and four cylinders add an uncalled for number of working parts and increase the liability to breakage. One cylinder, on the other hand, has few parts, but has the disadvantage of exhausting a correspondingly large volume which is found difficult to muffle. The power of each impulse is, of course, increased and the pulsations are readily noticed by those riding in the carriage. With a single-cylinder motor a large and heavy fly-wheel is always necessary, and this is found difficult to conceal in the body of a vehicle.

A sensitive and reliable governor should be added to the motor. Such a governor should always prevent racing when making stops. The governor has a further power that makes it especially valuable for vehicles. In descending grades the governor has the power to hold the vehicle back and maintain an even speed.

The writer has had considerable experience with single cycle motors; *i. e.*, motors that produce an explosion in each cylinder at every revolution. These motors certainly look most tempting, but should always be carefully tested by a continuous run before being purchased. Their life seems to hang by a slender thread. Slight changes in temperature seem to affect them; they are uncertain in starting and often stop without an apparent cause.

In the Otto cycle motor the alternate explosions leave an interval between, in which the heat is radiated from the pistons, cylinder heads and other parts. At the same time the piston draws in the next charge and allows it a chance to become properly mixed in the cylinders. The single cycle motor, on the other hand, does not allow these possibilities, and consumes more water per horse-power than does the Otto type. Although an explosion takes place at every revolution in the cylinder of a single cycle motor, yet it does not permit of the cylinder being made with half the volume of the Otto cycle cylinder, as might be supposed. To approximate the same results the single cycle cylinder must be made with considerably more than half the volume as compared with the Otto cycle cylinder.

A five horse-power motor seems well suited for general purposes on American roads. A motor of less than four horse-power cannot be recommended for a vehicle weighing more than 900 pounds. The perfect condition of the French roads, perhaps, explains the fact why a large number of three and a half horse-power motors are used there. Carriages equipped with so light a power cannot meet with success on our roads, and it is doubtful if they could have finished in the *Times-Herald* race on Nov. 28.

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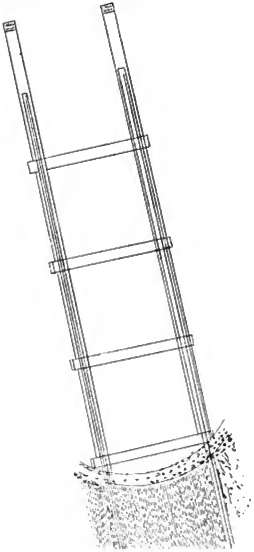
A private test of a motor delivery wagon, invented by M. Mischel, of Gloversville, N. Y., was recently made in that city. The attachment was made for Martin & Naylor, a local firm, and while the test was considered a success, the public trial will not be made until the spring.

A Steel Track Highway.

One of the most interesting of the exhibits at the Road Parliament recently held at Atlanta, Ga., was the model of a steel track highway, invented by the Hon. John O'Donnell, Lowville, N. Y. This exhibit attracted general attention, and it was the unanimous opinion of those who saw it that the steel track highway is the highway of the future.

The idea of the inventor is to construct two steel tracks of standard width, on each highway, for vehicles going in both directions. The tracks, which are made of rolled steel, are 5 inches in width, and ¼ of an inch in thickness. At the edges are shoulders ½ an inch high, and flanges extending outward and downward. The tracks are securely bolted to



PLAN OF STEEL-TRACK HIGHWAY.

timbers 3 x 6 inches, extending lengthwise with the track, these same timbers being in turn secured to cross-ties.

Aside from the fact that the track is flat like a gutter, the road looks like an ordinary street railroad.

Between the tracks the roadway is of stone, sloping from the centre, so that perfect drainage is secured. The water runs into the tracks and is carried off by side conduits whenever a depression is reached in the road.

The advantages claimed for this road are cheapness and ease of construction; uniform system, which could be extended all over the United States, Canada and Mexico; an ideal bicycle and motor vehicle track, and one easy for horses as well, for it is estimated that a horse can haul 20 times as much on steel as on a dirt road, and five times as much as on a macadam road.

Between the tracks the road can be composed of dirt, stone or asphalt, and so simple is the construction that contractors estimate that a mile of it could be built in a day with an ordinary force of men.

At the Road Parliament a resolution was passed recommending the construction of experimental sections of this steel track road in various States, in order to test the practical value of the system.

The Pennsylvania & Maryland Steel Co., of Philadelphia, have entered into a contract with the inventor to supply these tracks for the present to any section of the country, and have secured the exclusive sale of them in the district east of the Alleghanies. Similar arrangements will be made with some large steel manufacturer in the west.

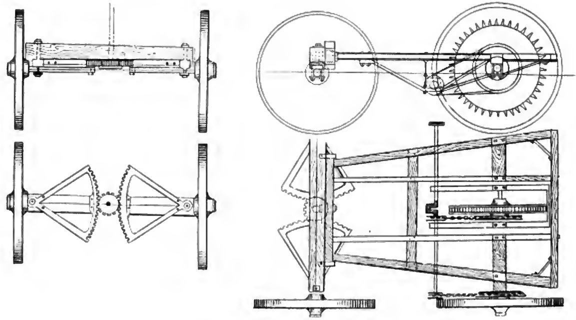
At the annual meeting of the L. A. W., held at Baltimore, Md., Feb. 10, Mr. O'Donnell exhibited and explained his models to attentive listeners.

Driving and Steering Gear for Motor Wagon.

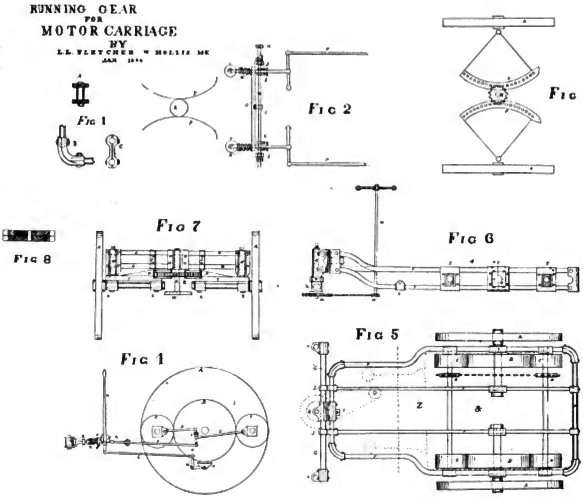
L. L. Fletcher, North Hollis, Me., sends a number of drawings, covering a plan for the application of power to a motor vehicle, which he has been maturing for several years.

A is the driving wheel (Fig. 4). *B* is a friction pulley fast on the shaft. *C C* are friction pulleys, which are brought into contact with pulley *A* by the lever *H* and through rods *F* and *D D* and fulcrum lever *E*. The lever *H* also works the brake through the lever *L* and bell-crank *M* and shoe *N*.

When the lever *H* is thrown forward the cam *I* on the rocker shaft *W*, shown in Fig. 2, presses the yoke *G* forward and applies the friction, or in other words, brings the pulley *c c* and *B* into contact. When the lever *H* is thrown back, the cams *J J* engage the studs *K K* and open the pulleys *c c*, when the driving wheels run free and the brake can be applied by drawing the lever still further back. The springs *Q Q*, on rods *F F* are, made very stiff for two reasons: First, to hold the frictions in contact, though not so hard but any small substance could pass between the pulleys and prevent damage to the lever and connections. Second, the segment gears on the forward shafts, when moved by the steering pinion, *R*, enough to turn the carriage on a curve, act as a cam on the rolls, compressing the springs *Q Q* and releasing the frictions on one side by compressing the spring on the other side, by a movement of the yoke *G* the tension of the spring on the opposite side is increased through the yoke *G*, giving more friction to the side that is driving through the curve. As the frictions have to be moved only about ⅛ of an inch to release their hold on the driving pulley *B*, it would hardly make any difference with the sprocket chains *E E*, shown in Fig.



STEERING GEAR FOR MOTOR WAGON. L. L. FLETCHER, NORTH HOLLIS, ME.


RUNNING GEAR
FOR
MOTOR CARRIAGE
BY
L.L. FLETCHER W HOLLIS ME
JAN 1896
Fig 1
Fig 2
Fig 3
Fig 8
Fig 7
Fig 6
Fig 5
Fig 1
A
B
C
Z
&

5, and the gears between the engine shaft and the first friction shaft. It would only put the teeth into little closer mesh. In case of the frictions wearing and leaving the gears too open arrangements could be made so that the whole engine could be moved closer. Fig. 5 is a plan of frictions, tubular main frame, and rocker frame, which carries the forward wheels, shafts and steering gears. The engine will occupy spaces marked *Z* or *&*, as most convenient for the style of carriage. A glance at the cut will show the style of frame with but little explanation. It is made of tubing, held at the corners by the clamp plates of which a plan and section are shown in Fig. 1. The bolts in the corner plates pass through the tubing. In all intermediate connection they both pass to one side of the tube, and a small dowel is inserted between the clamp plate and tubes to prevent working out of place if the bolts should become loose. *G G* is the rocker frame held to the main frame by the swivel bolt *I*, which allows the wheels of the carriage to conform to the irregularities of the surface without racking the main frame. *H H* are sockets through which the pivot shafts work, said shafts being secured to a plate marked *Y Y* in Fig. 7, and shown by the dotted lines at *H H*. The steering segments are also secured to said plates, shown at *P P* in Figs. 3 and 7. * * * * are the boxes which are held to the plates *Y Y* by bolts. In this arrangement of shafts and boxes the advantages claimed are that it is convenient to overhaul, any size oil cellars can be used, and that the boxes can be packed to run months on a heavy wagon, while on light carriages self-feeding oil cups can be applied. As the segments are made of wrought iron with a flange projecting over and under the sides of the pinional gear, the end of the shaft is held firm, and vibration up and and down is prevented. The back lash between the teeth of the segments and pinion is taken up by the arrangement shown in Fig. 8. It will be seen that the gear is in two pieces, the lower half being cast with a hub on the upper side, and keyed to the shaft *K* (Figs. 5, 6 and 7). The upper half fits around the hub of the lower half, the teeth coming in line on both, but in case of wear, by loosening the binding bolts that hold them together, the upper can be turned a little, thereby widening the tooth on the pinion and filling the space of the rack teeth. In case of breaking the teeth on either rack at pinion repair is easy, as the former is made of two wrought iron or steel plates with the teeth inserted, shown in section in Fig. 1 *A*. For a tooth I would use a bushing with a bolt through, on account of the ease of replacement. In case of stripping the teeth of the pinion, which would be likely to occur at opposite sides, it can be taken apart, and the upper half turned until the whole teeth overlap the broken ones in the lower half, and thus the gear could be used until a new one could be substituted. By the dotted lines in Fig. 5, it can be seen that the steering wheel can be put in any place, or two or more can be used by the addition of another sprocket wheel on the shaft *K*. The lever *H*, which applies the brake and friction, can easily be arranged to start, slow down or stop the motion.

Mr. Fletcher states that in constructing a working drawing from these plans, he would do away with all crooks and joints in the frame and rods, and that in places where pinholes and pins are here represented, threads and check nuts would be substituted. The drawings here published are simply intended to convey a general idea of a plan for a motor carriage.

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The motor movement is universal. The civilized world says the horse must go.

HYDRAULIC TRANSMISSION OF POWER.

A Lecture by Harry E. Dey.

I will begin by quoting a few paragraphs from *An Engineer's Pocket-Book* edited by Mr. W. H. Fowler, M. I. M. E., etc.: "Water is a practically incompressible fluid, and pressure applied to it is transmitted without loss, while nearly stationary, without inherent friction or waste due to the liquid itself. The convenience of hydraulic pressure arises from the simplicity and ease with which the power can be transmitted from one position to another, the only trouble being due to joints and connections, and difficulty of obtaining sound and homogeneous metal."

"Pressures considered high for steam practice present insignificant difficulties when compared with those of keeping sound joints even under hydraulic pressures of 4,000 pounds to the square inch." We only expect to use 80 for normal work.

"The main principle of hydraulic engineering is stated in the axiom: 'Fluids transmit pressure equally in every direction.' Thus if a vessel, such as a square cistern, be closed upon every side and fitted with two plungers of different areas, and a pressure be exerted upon one, then the pressure transmitted by the other will be directly proportional to their relative areas. In other words the ratios of the total pressures upon each will vary as the squares of their diameters."

"By these self-evident means we easily obtain great pressures from small original pressures, as, seeing that pressures vary as the areas, it only remains to increase the diameter of one plunger and decrease the other in order to obtain a great multiplication of pressure. For instance, assume a small piston whose area is half an inch, pressed by a lever to the extent of 100 pounds, and that we require upon another object a pressure of about 10 tons; this large increase can be obtained by making our ram or plunger a diameter of 12 inches."

"The above example proves only half of the truth in this study. The gain in power is compensated for by the reduction in speed. Thus the large ram having 226 times the area of the small plunger will travel at 1-226 of the linear speed of the latter, so that to raise the 12 inch ram one inch the movement of the one-half inch plunger in the same time will be 226 inches."

So much for the main principle of hydraulics. Let us leave the subject for the present and consider some of the foundation principles of electric motors and dynamos. If an electric conductor, for instance a wire, be passed between the poles of a magnet, so as to cut the magnetic lines, a pressure of electricity will be generated. This is called electromotive force, and corresponds to the pressure of steam, but we use the term volts instead of pounds to express the amount of pressure, while the term amperes represents the quantity corresponding to cubic feet passing in a given length of time. Now the pressure generated in this wire will depend on three things—the velocity of the moving wire, the strength of the magnet, and the length of active wire, that is, that which is passing between the pole-pieces. If the ends of the wire are connected so as to form a complete circuit a current will circulate through it. The number of ampers thus passing will be the quotient of the E. M. F. divided by the resistance of the circuit in ohms. While the ends are disconnected, and hence no current flowing, the wire will pass through the magnetic field without opposition, but as soon as a circuit is formed there is a strong pull back on the wire, and the lower the resistance is made the greater their back pull will be, as it allows a larger amount of current to pass through. This is the little joker that upsets the calculations of our perpetual motion inventors, who bob up every now and then with a scheme to produce power from an electric motor and utilize a part of that power to run their dynamo to supply the motor.

This example of the wire cutting the magnetic lines is the basis of all dynamos and motors; for if we send a current of electricity through the wire in the opposite direction to that generated by mechanical power, the wire will be pulled forward in the same direction that we formerly forced it by mechanical power, but the wire will be acting at the same time as a dynamo to create a pressure of electricity in the opposite direction to that which is driving it, and almost equal in voltage—we call it the counter E. M. F. Electricity cannot travel in two directions at once on the same wire, the consequence is that the counter E. M. F. acts as a back pressure to the applied current, so that the actual amount of electricity that flows through is the amount that the difference of the two pressures will force through the resistance of the circuit. Take for instance a motor, which is practically nothing more than a wire wound around an iron core—say that it is designed to run with 100 volts, let it run free, without a load except the friction of the bearings and brushes, it will be generating as a dynamo perhaps 99 volts.

In that case the amount of current passing through will be what 100-99, or one volt will force through the resistance, which let us suppose is one ohm, then one volt divided by one ohm equals one ampere, so that the amount of power being consumed in the armature is one ampere by 100 volts or 100 watts. Now, if we load the motor enough to lower its speed 1-99 it will develop one less volt pressure, the consequence will be a difference of two volts between the opposing E.M. Fs. This will force twice as much current through, and hence develop twice as much power. This can be continued indefinitely until the limit of the carrying capacity of the wires are reached. Now, let us take our free running motor again, and this time reverse the action by applying mechanical power and run it at an increase of 1-99 speed. I will then generate 100 volts, and the opposing pressure will be equal, and no current will flow in either direction. Any further increase above this will cause the counter E.M.F. to exceed the direct E.M.F., and the motor will be acting as a dynamo. To cause a motor to be its own governor in this manner it is necessary that the strength of the field magnet be kept always constant. A shunt-wound motor fulfills this condition perfectly, as the field is excited independently of the armature current; while in a series of motors the strength of the field is constantly varying, according to the amount of current passing through the armature. If the load be taken from the latter it will attain a terrific speed, as its counter E.M.F. keeps decreasing as the armature current decreases. Shunt-motors are used almost exclusively for stationary purposes.

Series motors are well adapted for boats, cars, vehicles and other variable speed apparatus. Their advantages in these cases will be readily seen as it is self-evident that a greater range of speed may be obtained from them, although at a large sacrifice in efficiency, for the fields are almost always saturated, and consequently the wire is only acting as a rheostat: besides this there is the regular rheostat, or current eater, which is used to vary the speed.

In designing a motor the method used to calculate to horse-power is to multiply the counter E. M. F. by the carrying capacity of the wires in amperes. Now as the E. M. F. of a given armature depends entirely on the speed and strength of field, it follows that if the speed is decreased one-half the power of the motor is decreased a like amount, unless the strength of the field is increased a similar amount. This is impossible except when the variation is small. From this we readily see why it is that 50 and 60 horse-power in motors are placed upon electric cars, which only require an average of about five horse-power to drive them. We see that a 60 horse-power outfit designed for speed of 600 revolutions per minute if brought down to a speed of six revolutions will only furnish 1/100 part of 60 horse-power or 6/10 of a horse-power unless overloaded. They may be overloaded to furnish perhaps three horse-power at this speed.

From the foregoing it will be seen that a shunt motor possesses many advantages, providing that a satisfactory variable speed gearing can be devised. Let us look into the hydraulic gear and see what we can accomplish with that.

In my system of hydraulic gearing I propose to use a pump—or rather two—which are operated by a shunt-wound motor. One is driven by the armature and the other by the field. I revolve both field and armature, for by doing so, double the counter E. M. F., and hence double the power from a given weight of motor is obtained. The crank pins of the pumps are capable of being adjusted at any point from the centre, where they constitute practically a part of the shaft, to one and one-half inches either side of it. This course varies the stroke anywhere from zero up to three inches, and when the pin is one side of the centre it drives the oil in one direction, and the reverse when on the other side. These pumps are connected to fluid motors on the axles of the car by flexible pipes; the two fluid motors and pumps being all connected in series and alternating in position. The whole arrangement is filled with oil. The fluid motors are driven at a speed depending on the relative capacities of the motors and the pumps, and as the capacity of the latter depends on the position of the crank-pin, it follows that the pin will entirely govern the speed and direction of the car.

The motor is kept running on ordinary stops of the car, but is consuming very little current, as it is not operating any machinery. In starting a car the crank-pin is moved slightly from the centre. This gives a quick-acting, but very easy, positive start without any jerk. While the motion is very positive it is held in check, as it were, so that it cannot leap ahead except as the pins move farther from the centre. The two principles of the hydraulic transmission and the automatic governing of a shunt motor combine to give an ideal start.

For cars I do not propose to use over a 20-hp motor as an extreme limit. This will be only one-half the size of other

...JOIN...

THE

American

Motor League

motors of the same power because of the field and armature both revolving. This will do away with 3,000 pounds weight. I also dispense with the controllers and rheostat; also the weight of one car wheel, as 24-inch wheels can be used which will be more satisfactory to the public than the 33-inch ones now in use. This saves altogether fully two tons in weight, which is 25 per cent. of the weight of a fully loaded car. This naturally means a similar saving of 25 per cent. in the power required to drive the car. On all down grades the motor will be converted into a dynamo and will return current to the line and at the same time act as an ideal brake. All other brakes may be entirely dispensed with. A very conservative estimate will show a saving of at least 50 per cent. in current consumed over any system now in use. When we come to take into consideration the amount saved in weight, and the current efficiency of a shunt motor, and the amount of current returned to the line on down grades, and that perhaps at points far from the power house, where it will do other cars a far greater amount of good than a similar amount generated at the power house. The size and cost of the power house feed wires, etc., may be reduced more than one-half, for besides the saving mentioned the sudden fluctuation will be done away with.

The lights will be steadier for the same reason; there will be no trouble from the frequent blowing of fuses and many annoyances will be avoided.

Last but not least, is the field it offers for the alternating current, for it offers the only solution to the use of the single-phase alternating synchronous motor. It will have all the advantages with this machine that it has with the shunt motor. This will open a very wide field for long distance transmission. The electrical engineer of one of the largest steam roads in the country has examined the system with that object in view, and has expressed himself as thoroughly satisfied that it is practical, and the ideal method for long distance transmission for electric railways.

This system is equally applicable to street cars, horseless carriages, elevators, or any other purpose where a variable speed gearing is desired to go with a constant speed motor. It has the advantage over all friction devices that there is absolutely no slip, no matter how heavy the load may be.

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The H. Mueller Mfg. Co., Decatur, Ill., state that it is their intention to manufacture motor wagons, but not on a large scale at present. All they expect to do this year will be to get out a small number for races to show what they can do. They have received a number of good offers for the vehicle they had in the *Times-Herald* races for exhibition purposes, but as yet have not accepted any.

The Motor League

has a Mission.

JOIN IT

COMMUNICATIONS.

Not a Spelling Reformer.

Editor Horseless Age.

DEAR SIR:—In your issue of December, 1895, page 8, article "Uniform Spelling," you announce your intention hereafter to adopt the uniform phonetic spelling of "ene" as the termination of all names of hydrocarbons, "believing that there is no good reason" for spelling one with an "ine" and another with an "ene," and cite, in particular, "benzene" (you evidently supposing it to represent "benzine"). To many of your readers it would appear that there was really no specially inherent significance between an "ine," "ane," or "ene" termination of a chemical compound, and that these "spellings" were nothing more than the result of the orthographic looseness of usage. The writer, however, would ask if your decision has not been based on the same superficial view of the matter, inasmuch as an investigation of the chemical terminology of the hydrocarbon "groups" shows positively and conclusively that the compound "benzene" (or "benzoyl") and "benzine," while having some common points of likeness, have equally marked points of difference, in the fact that the proportions of carbon and hydrogen are different, and to represent, therefore, both compounds by the same name, would be equivalent, in the writer's opinion, to calling a male and female a "male," this merging can only be productive of confusion. Further, extending the application of the change you propose to the hydrocarbons "pentane," "pentene" and "pentine," making all read "pentene;" how would you represent in the one name "pentene" the peculiar characteristic and basic formula of each, it being now known that the formula of pentane is C_5H_{12}, pentene, C_5H_{10}, and pentine, C_5H_8? A word to the wise is probably sufficient. There is no intention of sarcasm in calling your attention to the above. Yours truly, V. INNES.

NEW HAVEN, CONN.

◆

A Query or Suggestion.

Editor Horseless Age.

DEAR SIR:—Seeing the illustration of Olsen's boating and cycling machine in the January HORSELESS AGE, page 22, the idea occurred to me: Why not construct a land and water vehicle by having, say, four wheels provided with pneumatic tires sufficiently large to float the vehicle and rider? I think that four wheels, about four feet diameter, with about 10-inch tires (10-inch tube), would float the vehicle and rider. If the tires were made large enough to float the machine without drawing much water, I think that it could be propelled upon the water without providing the wheels with buckets or paddles.

A SUBSCRIBER.

ENGLISH papers, writing on motor subjects, show a strange confusion of terminology. In one and the same article we find "horseless carriage," "motorcar," "self-propelled vehicle," and "automotor" used synonymously. Plenty of variety, surely, but not the right term yet.

Join The American Motor League.

.... 189

American Motor League,
335 DEARBORN STREET, CHICAGO.

I hereby make application for membership in **THE AMERICAN MOTOR LEAGUE**, and I agree to comply with the Constitution, By-Laws and Rules. I enclose Two Dollars for initiation fee and One Dollar for annual dues.

Name..

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Town.......................... *State*..........................

Cut this out and send it to the Secretary, Dr. J. Allen Hornsby, 335 Dearborn Street, Chicago, Ill.

Disc Motor of Dr. Alexander J. Peet.

Dr. Alexander J. Peet, of 46 West 24th Street, N. Y., has just completed plans for a launch motor that is remarkably compact, light and cheap in construction, and exhibits a number of very novel features.

The motor here shown is of horizontal construction and sits low in the boat fore and aft. It consists of a single large cylinder, 20x36 inches, enclosing five cylinders, each five inches in diameter, the whole being cast in one piece, and the centre being reserved for water to cool the cylinders. By this arrangement both space and cost are saved.

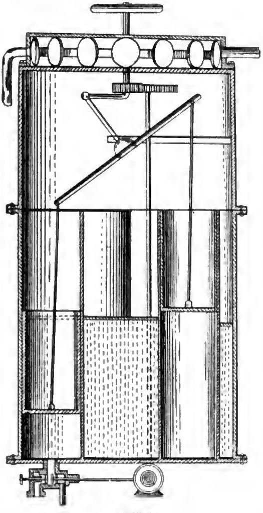


FIGURE 1.

Each cylinder is connected to a disc, which operates a single crank.

The stroke is seven inches, and the inventor calculates full three horse-power from each cylinder, the total of 15 horse-power being further increased to 18 horse-power by a very ingenious utilization of the exhaust upon the balance wheel.

This balance wheel is extremely light, and is enclosed in a case like a water motor. The expelled gases strike against wings or discs attached to the periphery of this wheel, thus equalizing and increasing the power, and subduing vibration.

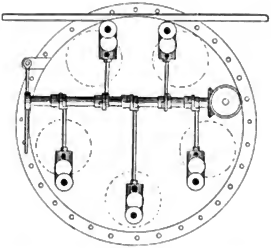


FIGURE 2.

Dr. Peet estimates the pressure of the exhaust of the gas engine at from 30 to 50 pounds to the square inch, all of which is lost in engines of the ordinary construction.

As there are five cylinders, and an explosion in each every other revolution, there are two and a half explosions at every revolution, thus doing away with the dead centre and preventing vibration.

The chief advantages which the inventor claims for this motor are:

1. Low centre of gravity, which is very desirable in a launch motor.
2. Light weight.
3. Simplicity of construction.
4. Cheapness.
5. Absence of vibration.
6. Doing away with the heavy balance-wheel by the use of the exhaust.

The estimated weight of the motor here described is from

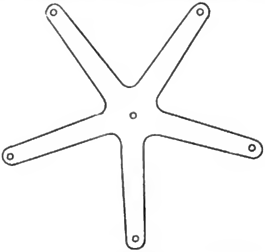


FIGURE 3.

800 to 900 pounds, and it has sufficient capacity to drive a 50-foot boat. The number of cylinders, however, may be increased, all working on one crank, and much higher power obtained with comparatively slight increase in weight. A 50 horse-power motor would comprise seven cylinders, each 7 x 9, all in one casting, the dimensions of the encasing cylinder being 30 x 40 inches. The weight would be about 1,500 pounds, and the cost, according to the inventor's estimate, should not exceed $1,000. This small and inexpensive motor would drive a 100-foot boat, and without the excessive vibration which attends the use of one or two cylinders.

In the diagrams Fig. 2 represents the end view of the cylinders and the eccentric, showing the poppet valves. Fig. 3 is the disc to which the connecting rods are attached by means of ball joints.

The doctor also states that the water in the interior jacket can be piped to the exhaust, where, in contact with the hot gases, steam will be formed, which will add its pressure to the rotary wheel, and thus add to the power generated.

The motor is reversed by a special lever shown in Fig. 2. The gases of the exhaust being then thrown on the opposite faces of the discs of the rotary wheel, have sufficient force to start the motor in the opposite direction. In this respect the Peet motor differs from all others.

This motor could also be adapted to vehicles. A four or five horse motor would weigh about 150 pounds. The encasing cylinder would be 10 by 15 inches.

Portable Boat Motor.

The accompanying cut represents the latest adaptation of the American motor—a 1½-horse boat motor—which can be carried about and attached to any small boat up to 16 feet in length in five minutes, without marring the boat.

The motor weighs 50 pounds, fly-wheel included; the cylinder is 3¼ inches, and the stroke 4 inches. The number of revolutions is 600, and the cost of fuel, gasolene or kerosene, is said to be one cent an hour.

The propeller, which is at the same time a rudder, is reversible, and is controlled by a lever under the steering handle, the speed being regulated by a change in the pitch of the blades.

The motor is clamped onto the stern in a horizontal position, and is capable of driving a boat at a speed of from six to eight miles an hour.

The makers are the American Motor Company, Havemeyer Building, New York.

The Empire Motor Company.

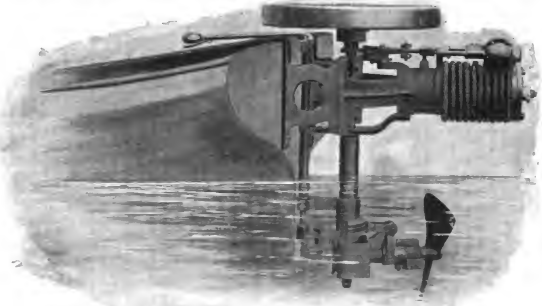
The Empire Motor Company was recently organized at Pittsburg, Pa., with a capital stock of $150,000, to manufacture motors and motor pleasure and delivery wagons, constructed entirely of steel tubing and having 30-inch bicycle wheels. The vehicles will weigh about 350 to 400 pounds, will be propelled by two horse-power motors, invented by William Morgan, manager of the company, and will be capable of speeds ranging from 3 to 20 miles an hour.

The motor, which is of the double cylinder type, has only six parts, and is without gear wheels. An explosion is obtained every revolution, and the consumption of fuel is about one tenth of a gallon of gasolene and carbon oil, mixed, per hour, for each horse-power. No water jacket is used.

The valves are controlled by an eccentric, and the supply valve has an automatic air chamber that allows only the proper quantity of air to enter the cylinder.

Two levers are used to control the wagon, one to steer and change speed, and the other to stop, start and reverse. Grades of from 15 to 20 per cent. can be surmounted.

The company will also make a specialty of light motor traps in which no machinery will be visible except the steering lever and a small sprocket wheel and chain. These vehicles will be elegantly upholstered and painted in fancy carriage colors.



PORTABLE BOAT MOTOR. AMERICAN MOTOR CO., NEW YORK.

Mr. Richmond on Gas Engines.

George Richmond, manager of the motor department of the De La Vergne Refrigerating Machine Co., contributes an article on the "Limits and Possibilities of the Gas Engine" to the February number of the *Engineering Magazine*. In the course of his article he has this to say about motor or "horseless" vehicles:

"Oil engines (which constitute another special form of the hot-air engine) are apparently destined to supplant both gas engines and steam for moderate power. They have all the advantages of the gas engine, with the additional advantages of costing considerably less to run and being available in situations where gas cannot be obtained. The gasolene engine has enjoyed an ephemeral popularity, and will probably still continue in use where neither gas nor oil has been made available. This is notably the case in the so-called 'horseless carriage,' or automobile—the application at present most in evidence.

"The difficulties in this case are complex, and about equally divided between the motor and the transmission mechanism. The partial mechanical success obtained in Europe has created a craze for this class of vehicle. At present the inventors are exhausting all the possible ways of 'how not to do it.' Nevertheless, to the careful observer, some of the most pronounced failures are more suggestive than the most correct designs. The name 'horseless carriage' while it correctly represents the sphere of present activity also indicates wherein the same is at fault. No really successful self-propelling vehicle will be produced until not only the horse but the carriage builder is eliminated. The Pullman car is not a horseless stage coach, and the motor vehicle of the future will not be a horseless carriage.

"As regards the motor, no new principle is likely to be evolved, while we may expect many novelties in the way of mechanical construction. When the machine proper is lightened to the greatest possible extent, there still remains the necessity of carrying water for the cylinder. One horse power means the turning of heat into work at the rate of about 43 thermal units per minute. The heat passing into the jacket is about two and one-half times this, or say, 100 thermal units per minute. If a three or four horse-power motor is used, there is more heat than can be gotten rid of by conduction in any air-cooling device of reasonable dimensions, and a considerable weight of water must be carried, boiled away, and renewed.

"One inventor boldly 'denies the allegation and defies the alligator,' and also explains. The first explanation was that the motor, by virtue of using liquid gasolene, was a refrigerating machine in combination with an engine. As the latent heat of gasolene is about 1 per cent. of the heat of combustion, this explanation is clearly inadequate. The second explanation is a double spark, the first cooling and 'ripening' the mixture, while the second ignites it

"The interest in this explanation is confined to the treatment of it in the technical press as indicating the extent to which the principles of thermodynamics are or are not accepted, as the case may be. If one is willing to sacrifice the efficiency, it is easy to see how, in accordance with well-known principles, a large portion of the jacket heat may be thrown into the exhaust. The mean temperature of the cylinder must be maintained within moderate limits. Now, the initial temperature may be reduced by working with a very weak mixture, which results in delayed combustion, and the final temperature may be reduced by increasing expansion, the simplest and crudest method of obtaining which is to choke the suction. For further reduction of the mean cylinder temperature add misfires in sufficient quantity."

AMERICAN MOTOR LEAGUE.

A bill was recently brought up before the Ohio Legislature which was to prohibit any vehicle traveling upon the roads of that State, if propelled by steam, gasolene, electricity, or any other motive power; but by the influence and prompt action of the American Motor League the bearing of this bill was indefinitely postponed. This virtually means the withdrawal of the bill.

The American Motor League brought up the matter of admitting motor vehicles to the Chicago parks, and after considerable agitation the motor vehicle has been admitted to all of the Chicago parks on an equality with other vehicles.

A monthly bulletin will now be issued by the league, and will give a complete list each month of foreign and American patents pertaining to motor vehicles.

Correspondence is now being carried on with the Automobile Club of Paris, with an idea of exchanging with them a visiting membership.

THE DURYEA-KING MOTOR.

The Duryea-King motor is now being manufactured by Charles B. King, 112-114 St. Antoine Street, Detroit, Mich. This motor is of the Duryea type, is noiseless, weighs 200 pounds develops five horse power and consumes about one pint of gasolene per horse power per hour. It is specially designed for vehicles and launches. All parts are perfectly balanced, permitting of high speeds without vibration. This motor is self-lubricating and is designed for long runs without attention. Even in the coldest weather it can be started with one turn of the hand crank.

Mr. King is a mechanical engineer who has entered heart and soul into the motor business, and with his thorough knowledge of the subject, and facilities of manufacture, he will undoubtedly turn out reliable motors and plenty of them.

Journalistic Enterprise in Evidence.

Journalistic enterprise is again strongly in evidence in the launching of a new journal devoted specially to the interests of an industry as yet in its infancy, but which gives promise of lusty growth. From the widespread attention which the subject of motor vehicles is attracting, abroad and at home, there is little room for doubt that we will witness, in the next decade, great improvements in their construction, with a corresponding extension of their use for business and pleasure. The developments of the self-propelling vehicle may indeed rival that of the omnipresent bicycle in the past decade, whose popularity it seems not unlikely to share.

The enterprising publisher of The Horseless Age is evidently determined to take time by the forelock and to keep pace with, rather than to follow, the course of this unique industrial departure. If he has read the signs of the times aright, there should be a great future for his journal.

The initial copy before us makes a large quarto of some 50 pages, most of which are devoted to illustrations and descriptions of various forms of motor vehicles. It is well printed and makes a handsome appearance.—*Journal of the Franklin Institute, Philadelphia.*

TRADE NOTES.

The Horseless Age has a large field before it.—*Progress*, Minneapolis.

The Horseless Age is a well-managed publication.—*New Orleans Picayune.*

The editor acknowledges the receipt of the monthly journal of the Touring Club of France.

C. S. Fairfield, Portland, Me., has ordered a 10-horse motor for one of his large buckboards.

Charles H. Barrows, Willimantic, Conn., is building a finished model of his motor tricycle.

Haynes & Apperson, Kokomo, Ind., will have a full line of motor-carriages in various styles ready at an early date.

The Gas Engine & Power Co., Morris Heights, N. Y., are building a 76-foot naphtha yacht for J. Adolph Mollenbaner, of Brooklyn.

Callender & Patterson, dealers in machinery and tools, Dayton, O., are in the market for motor delivery wagons to carry 1,500 pounds.

The Northey Manufacturing Company, Ltd., engineers, of Toronto, Canada, are enlarging their plant, and wish to take up the manufacture of motor vehicles.

The Duryea Motor Wagon Co. have leased the entire building in which their shop is located, and are making as rapid preparations as possible to meet the demand for the Duryea motor wagons.

L. J. Wing & Co., 109 Liberty Street, New York, are applying Stewart's Patent Automatic Clutch to a tricycle delivery wagon, which they propose to manufacture in considerable numbers. The clutch regulates the wheels in rounding corners.

The Owatonna Manufacturing Company, Owatonna, Minn., are still continuing their experiments. L. T. Nichols, inventor of the system which they are perfecting, writes that they will not be satisfied until they have produced a vehicle that a woman can handle with ease. He reports progress.

McDonald & Co., Ltd., Halifax, N. S., will soon be in a position to furnish West's patent oil engines of both horizontal and vertical type. The vertical type will be used for launches and yachts. They are also contemplating the introduction of oil engines for running fog horns on ocean steamers and in lighthouses.

In a recent issue of the *Canadian Engineer* Arthur W. White, of London, Ont., argues for a motor vehicle contest in Canada the coming season. As an additional attraction at one of the great fairs to be held in several cities of the Dominion, he believes an exhibition and contest of motor vehicles would be a profitable investment.

Sir D. Salomons states that he has taken the trouble to collect the expressions of opinion respecting motor-propelled carriages of some 300 English newspapers. Of these 90 per cent. were in favor of the new mode of traffic, 8 per cent. were practically neutral, and said "Wait," while only 2 per cent. were adverse on sentimental grounds.

The Gordon-Burnham Battery Company, manufacturers of the Gordon primary battery, 82 West Broadway, New York, are about to place on the market a form of battery specially designed for motor and gas-engine work. This battery has established an excellent reputation in railroad, fire-alarm and signal work, and recent tests in the motor line have been equally satisfactory.

The Victor Rubber Tire Co., of Springfield, O., have fitted up a branch house at 425 Wabash Avenue, Chicago, in charge of President Frank Torrence. They have also established branch houses in New York City; Atlanta, Ga.; St. Louis, Mo., and at Batavia, N. Y., the Batavia Carriage Wheel Co. being agents at the last named place.

Mr. H. Daley, Charles City, Ia., will commence manufacturing his "motocarriage" about May 1. It will be handsomely finished in enamel, with nickel trimmings, and will be properly upholstered. The wheels are fitted with square-faced pneumatic tires, having outer bands, in which are flexible steel protection bands, that can be replaced at small cost when worn out. He is looking for a location for a factory.

Geo. H. Lewis, Minneapolis, Minn., has a spring motor which he believes is just the thing for a motor cycle. He describes it as an automatic arrangement, not over four inches wide, and fitting in the frame between the rider's legs. It has no gears, only ratchets on the power shaft to complete the rotary motion No change need be made in the frame of the bicycle. By putting in springs as batteries up to the required power, Mr. Lewis states that his motor can be applied to boats.

Lucius B. Packard, of Salem, Mass., states that he has devised a method of overcoming the slipping of steel tires on wet or muddy pavement, which he will gladly explain to any one who will send 10 cents in stamps to pay for postage and trouble. Mr. Packard believes that a motor carriage should be made as light as possible in front, so that the bulk of the weight may come over the traction wheels. He also believes that all the machinery should be tightly encased, to protect it from the dust of the road.

In the New York *Independent*, of Feb. 6, William Steinway, president of the Daimler Motor Company, writes on the Daimler motor and motor vehicles generally. He says that the Daimler carriages, now in course of construction for the American market, will be adapted to the standard track of American vehicles, which differs somewhat from the foreign, and closes with the assertion that motor vehicles have come to stay, and that their manufacture will at no distant day be one of the chief industries of this and other countries.

SPECIAL NOTICES.

—o—

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THE HORSELESS AGE.

A MONTHLY JOURNAL

DEVOTED TO MOTOR INTERESTS.

Vol. I. NEW YORK, MARCH, 1896. No. 5.

THE HORSELESS AGE.

E. P. INGERSOLL, Editor and Proprietor.

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Effect on Land Values and the Distribution of Population.

One of the most interesting phases of speculation called up by the motor movement relates to its probable effect on land values and the distribution of population.

In the aggregate the constant tendency of land values is to increase as population increases, and there is no reason to believe that this tendency, now very strong in this country, will be checked for some time to come. Every mechanical improvement introduced adds to land values, which may be considered as the capitalized value of civilization.

But while the general tendency to increase will in all human probability remain unchanged, local changes are bound to result from the general introduction of motor vehicles as they have resulted from the introduction of other improvements in locomotion.

The trolley car has opened up suburban property, and by connecting rural towns has made populous streets where before were farmers' houses.

The bicycle has had a similar effect upon land values, pushing the line of possible residence near business centres further out, and hence making such outlying sites more desirable and more valuable.

The slight depreciation which these new agencies of locomotion have caused in the case of land devoted to industries injuriously affected by them is but a sign of the stimulating effect in other directions. The bicycle and the trolley have depressed the prices of certain grades of horses, and this has undoubtedly depressed the values of some lands devoted to raising such grades of horses, though this depression is apt to be quickly relieved by putting the land to more profitable uses.

Country hotel sites have in many sections been given additional value from the fact that they are frequented by bicycle riders seeking rest and refreshment on their outings.

The general adoption of the motor vehicle will intensify these tendencies. It will make suburbs easier of access, improve the trade of country hotels in many places, and still further depress the business of horse-raising. Much of the land now used for horse-raising and growing horse feed will in process of time find other uses more in harmony with the trend of progress.

The establishing of new factories will stimulate the growth of population locally, as has been observed in the case of the bicycle industry, but there is not the slighest hope that the motor vehicle will relieve the congestion of cities; for the congested districts are inhabited by the very poor, who cannot afford to buy vehicles of any kind.

Society for the Promotion of the Motor Vehicle.

It has been suggested that a society be organized in New York City for the encouragement of the motor vehicle. A society with this object has been in existence for some time in the City of Paris, and has done excellent service by organizing exhibitions and races, and in other ways gaining public recognition for the cause. As the Paris society is composed of leading statesmen, manufacturers, engineers and patrons of the arts and industries, it is able to wield great influence, inspiring a confidence in the public mind that is most important in the initial stages of the industry.

The gentleman who offered the suggestion volunteered to start the subscription, and stated that he believed a sufficient sum could be realized from public-spirited citizens, carriage and bicycle manufacturers, motor manufacturers and others interested to enable the society to incorporate and begin its useful work.

Several names were brought up for consideration, such as the Society for the Encouragement of the Motor Vehicle, or the Society for the Promotion of the Motor Vehicle, but no choice was made.

One of the chief functions of the society would naturally be the raising of prize funds for motor competitions.

What relations it should have with the American Motor League is a question to be determined by consultation, but it could certainly act in harmony with that organization, to their mutual advantage.

Officers of the League, and any readers of The Horseless Age, who desire to present their views. are invited to do so.

The Revised Cosmopolitan Code.

The organizer of the *Cosmopolitan* race is to be congratulated on the revision of his judicial code, which now gives fewer points to speed and more to simplicity and control. If he will now go further and change his programme to a parade through the city and let the race begin in the suburbs, he will establish a sound precedent.

The police regulations limit the speed of vehicles in the City of New York to five miles an hour. In Central Park a somewhat livelier pace is permitted, seven miles an hour being the limit there. As the greater part of the course is within the city limits, the opportunity for racing is very slight, and contestants may be tempted on that account to take greater chances after passing the city limits.

A race is a speed test, and an award to any but the fastest is an anomaly.

Holding races on common roads is also an anomaly, for it is contrary to the public safety.

The development of extremely high speed in motor vehicles is likewise an anomaly, because the fundamental mechanical features which distinguish the road vehicle from the track vehicle are not yet fully perfected, and high speed has no practical application to-day outside of a race.

The only way to avoid these inconsistencies is to hold races on race tracks, decide them on the ground of speed, call long-distance competitions road contests, and decide them on the ground of durability and general utility.

The Conflagration Scare.

An English journal which is somewhat inimical to the new vehicle says in regard to the coming increase in the consumption of oil from this source:

"The prospect of extended storage of oil here, there and everywhere may render such a conflagration possible as that pictured in imagination by a writer in a current magazine. Only those who have seen an oil store in flames can realize the efforts that are needed to prevent neighboring buildings catching fire."

If objectors to the motor vehicle would use their common sense, and make fewer pictures in their imaginations, they would do a valuable public service, though they deprived themselves of a pleasing pastime. Oil is stored here, there and everywhere now, yet the "conflagrations" due to this fact are very few. An increased consumption will probably increase to a very limited extent the liability to fires from this cause. An insurance actuary could undoubtedly reduce this liability to figures in a very few minutes, but the figures would be so small that the editor's conflagration would dwindle to a a bonfire.

An Example of English Common Sense.

The new law which the English Parliament has doubtless already passed to regulate the use of motor vehicles on common roads is most commendable in its liberality. The laws already in force in English-speaking countries are quite sufficient to cover any violations of the rights of the road which users of motor vehicles will ever commit. Common sense and common usage have taught people the necessity of care and watchfulness in guiding vehicles through the public streets. The same consideration for the safety of others will be the guiding principle in the use of motor vehicles. Intoxicated or reckless persons occasionally violate the law to-day, and the same class of persons will, without doubt, occasionally violate the law when motors are in common use, but these rare exceptions can be dealt with as easily then as now. No special legislation is required.

Mr. Pennington's "Defi."

FROM "pastures new" across the sea the irrepressible Pennington hurls a "defi" to all constructors of motor vehicles, daring them to come to England and pit their inventions against his for a consideration of $5,000, which he generously offers. Not long since, several obliging gentlemen on this side of the water stood ready to accommodate Mr. Pennington with such a contest without cost to himself, but for some unexplained reason he left his American laurels to wither, and sought other shores. Buying motor contests at $5,000 when they can be had for nothing is a species of extravagance that should not be encouraged. The money would be better spent on the vehicles.

In contrast with the noise about the Pennington motor in England, the silence in America is significant.

Now for the Motor Truck.

THE motor truck problem presents some special difficulties not met with in lighter vehicles. Some experimenters are endeavoring to apply the power to each wheel, but this introduces complications in steering.

The steering of a heavy motor wagon is in itself no easy task. Great leverage is needed to move the wheels under a load, and at the same time the shocks and jerks of the road must not cause the motorman to lose control of the lever.

Perhaps it may be found desirable to put the load well to the rear, and thus relieve the forward trucks of most of the weight.

The "Road Locomotive" Idea.

EDITORS who regard the motor wagon as a road locomotive can hardly be expected to have correct ideas of the nature and scope of the new invention. With such a fundamental misconception it is not singular that they should believe the motor wagon as impractical except on smooth asphalt pavements, and should picture these ponderous "road locomotives" rushing with the speed of an express train through city streets. The locomotive is a track vehicle, and the motor wagon a trackless vehicle, and if we would understand the latter we must first rid our minds of the locomotive idea.

The Best Work on Engines.

PUBLISHERS of the standard works on gas engines report that the extraordinary demand for literature on this subject which has arisen within the past six months has entirely exhausted the supply, rendering it necessary to print new and larger editions. The best work on gas engines for the student to consult, however, is THE HORSELESS AGE, for it contains the history of the latest thought in this line. The knowledge of the past is helpful, but the knowledge of the present is essential.

Saddle Horses $30 Apiece.

THE fate of the saddle horse can be read in the figures which were obtained for a number of fairly good stock at a recent sheriff's sale in New York. Eighty-nine of them went under the hammer at an average price of $30 apiece. Verily, the bicycle is having a decidedly bearish influence on the horse market.

◆

WITHOUT the rubber tire the motor vehicle would not be practicable in the present condition of our roads. The tendency toward the use of larger tires, both solid and pneumatic, is in the right direction. The motor vehicle requires an ample cushion to equalize the inequalities of the road, relieve the machinery from shock and jar, and make riding easy and comfortable.

◆

THOSE who have followed closely the recent changes in the construction of motor carriages abroad cannot fail to have noticed the tendency to a lower and longer build. The low centre of gravity and extended base give stability, make the vehicle easy of access and lessen the danger of accident. The appearance is naturally strange at first, but we shall soon grow accustomed to it. The mechanic must set the fashion.

The Judicial Code of The Horseless Age.

One of the subjects now uppermost in the minds of motor vehicle experts is that of the judicial code or standard of merit under which awards may be made in motor competitions. The code published in the *Cosmopolitan* prize announcement meets with general disapproval on account of the preponderance of speed, but, admitting the minor importance of speed and changing its position in the scale from first to last, or nearly last place, the order in which the other points of merit should stand to each other is a debatable question on which motor experts have not yet come to an agreement.

The editor of The Horseless Age has already made it clear that the most essential feature of a motor vehicle in his estimation is the efficiency of its steering and speed-regulating mechanism, which can be aptly and briefly described as the control of the vehicle (termed manageability by Mr. Duryea). The reasons for this view were stated with sufficient fullness in the last issue of this journal, and need not be repeated here, but they are of such weight in the editor's mind that in the scale of merit he would give first place to control. Out of 100 points, 40 or 50 should be set aside in its favor.

Next in importance to control comes simplicity of construction, upon which durability and cost largely depend. A vehicle which has few parts will not be likely to get out of order, hence the expense of keeping it in repair will be light, and the first cost will be moderate. To separate these features, and give to each its proper relative value, is not easy. Probably 30 to 35 points would represent their combined value, which might be subdivided as follows: Simplicity, 15; durability, 10; cost, 10. The subdivision here presented is open to question, but the right of simplicity to the second place in the scale will scarcely be disputed by those who have thought carefully on the subject.

The term safety as related to motor vehicles is somewhat ambiguous. No wagon which is likely to explode should be allowed on city streets, much less in a motor competition. Used with reference to the different forms of fuel now employed in motors, it does not appear to be entitled to great weight, for none of these fuels is dangerous unless handled with gross carelessness. Its relation to steering and speed regulation has already been considered, and in this, by far its most important aspect, it is to be classed under control.

Comfort, which results from absence of vibration and shock in motion, ease of access, etc., is perhaps entitled to 10 points.

Speed is the last consideration. No one will build a pleasure vehicle which is not capable of a speed of at least 10 or 12 miles an hour, and this is all that is required for the present. Higher rates of speed are attained at the sacrifice of other more essential features.

When the vital features of control and simplicity are secured other features, such as appearance, comfort, etc., will deserve more consideration, but what is wanted now is the simplest and most manageable vehicle that modern, mechanical science can produce.

◆

Statistics prove that the bare pneumatic, if properly constructed, is very tough and lasting. In fact, it is asserted that a well-made pneumatic vehicle tire will outlast a steel tire on city pavements. The metal shield which several builders here and abroad are now putting on will prevent cutting and tearing, reduce ordinary wear and thus effect a saving to the consumer in this important item of expense.

◆

French critics find fault with the English race organized by the London *Engineer*. They think that the promoters have laid down too many restrictions, and that the results are not likely to prove so satisfactory as they would have been if broader ground had been taken.

◆

Physicians are close observers of the motor movement. They use horses for business purposes, and no one knows better than they the disadvantages of the horse in constant use. They are an intelligent class, and are watching developments with an appreciative and critical eye.

◆

There were more motors at the Sportsmen's Exhibition than at the Cycle Show, but then the cycle trade is so big and so busy that it has neither room nor time for outside attractions at present. Next year, though, it may be bigger and busier, it will have a few moments to spare for the motor cycle.

◆

Managers of fairs are hot on the trail of the motor wagon this Spring. It is likely that quite a number of the new vehicles will be exhibited in this way before snow flies.

Writers on motor vehicles fail to observe the distinction between a wagon and a carriage. The term wagon generally applies to the plainer and more angular class of vehicles, light and heavy, while the carriage is of more graceful, rounded outline and is constructed primarily for pleasure riding.

◆

Advertisers in The Horseless Age can get abundant returns, but the publisher gets no returns from the Post Office. Misdirected or loose copies immediately find their way into somebody's pocket, to be taken home and eagerly read. So far as the Dead Letter Office is concerned, The Horseless Age is too much alive ever to get there.

◆

The press is gradually working around to the proper terminology. It has got as far as "horseless motor" now, the next step will be to drop the "horseless" and stick to the Simon-pure motor.

◆

The *Indian and Eastern Engineer*, published at Calcutta, India, makes a strong plea for the introduction of the motor vehicle in India as a substitute for the tonga, the elephant, the horse and the camel. There is a growing interest in the subject in Calcutta, Bombay and other centres of India.

Tidings from Far Off India.

The motor vehicle has a great future in India. Horses are very dear there and all the imported stock is short-lived. The majority of the horses used in the cities come from Australia, Persia or Cabul. Since the introduction of bicycles the sale of horses has greatly fallen off, and the coming of the motor vehicle is expected to almost wipe them out entirely.

India is quite in touch with modern progress. Her rajahs and maharajahs follow closely the development of mechanical science. His Highness, the Nijem of Secunderabad, one of the richest princes in India, recently paid 12,000 rupees for an electric carriage, which was sent to him complete from Paris. One of his European grooms, who knew nothing about electricity, undertook to run it and succeeded in burning out the motor the first day, whereupon His Highness declared the machine a humbug and ordered it removed from his sight.

Several of the larger municipalities, such as Bombay, are desirous of substituting motor wagons for the bullock carts which now dispose of their refuse, and have dispatched engineers to England and France for the purpose of inspecting the European market and selecting some vehicle that may be adapted to the work.

The roads throughout the country are all of excellent surface, and no steep grades are encountered. Motor stages or carryalls, provided with 8-hp motors, could probably carry 15 or 16 passengers without difficulty, and would do a thriving business in the chief centres.

All vehicles for Indian trade would have to be provided with covered tops to exclude the sun and the violent monsoon rains.

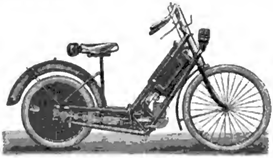
Motors at the Sportsmen's Exhibition.

The Sportsmen's Exhibition, which was held at Madison Square Garden, New York, from March 16 to 21, is worthy of special attention because of the prominent part taken by motor exhibitors and the interest manifested by the public in those exhibits.

The Daimler Motor Company, Steinway, L. I., N. Y., had one of their beautiful launches to show, and also a new model Daimler carriage, brought over from Cannstatt, Germany, by Mr. Kuehler, the vice-president, who has just returned from a European trip. Crowds gathered around this stand, and many snap shots were taken at the elegant carriage which, though it had been run several thousand miles through a mountainous region of Germany, revealed no sign of such hard service.

It is a two-seated vehicle, rather low in build, with canopy top, and four-horse upright motor in the rear, concealed from view by an ornamental case. The carriage is guaranteed to surmount grades of 15 per cent.

Another exhibit that was a centre of interest was the Hirsch motor launch, driven by the Hirsch gasolene motor, which was described in the January issue of The Horseless Age. The inventor stated that he had taken $25,000 worth of orders during the week.



MOTOR SAFETY.—HILDEBRAND & WOLFMULLER, MUNICH, GERMANY.

In the basement two motor safeties, manufactured by Hildebrand & Wolfmuller, of Munich, Germany, were run around the circle and explained to spectators by Von Lengerke & Detmold, sporting goods dealers, of New York, and G. Frank, who owns the United States patents on the invention.

In general form the motor safety resembles the ordinary safety now in use.

The front wheel resembles the ordinary front wheel with the small difference that the right part of the steering rod carries, besides the brake rod, an arrangement by which the pace may be regulated.

The rear wheel (driving wheel) is a disc wheel with 2½-inch pneumatic tires and a diameter of 22 inches.

The frame is built up mainly of eight seamless steel tubes, four of which form the perpendicular parts and four the horizontal parts, giving the frame a form similar to that of a ladies' safety. The eight tubes are connected at the joints with three small tubes. This peculiar construction makes the frame very solid.

The double cylinder motor is secured in the nearly horizontal part of the frame and is protected in such a manner that these parts cannot be hurt even in case of a fall. The control of the valves is effected by a rod connected with the rear wheel.

The explosion lamp (a battery may also be used), directly connected with the valve-box, is reduced to the smallest size. The lamp box is constructed in such a peculiar way that the air may enter and escape freely without any danger of the lamp being extinguished even by a strong wind. The lamp is filled from a tank of gasolene attached to the rising parts of the frame. The upper part of the tank is provided with a valve, by which the pace of the machine may be regulated.

The means of regulation is a small apparatus, attached next to the right hand near the handle-bar, and which can be moved by the thumb. A pressure on a button next to this apparatus closes the valve immediately, and prevents further explosions. By a pressure on the side of this button the explosions may be renewed.

The two tubes of the rising part of the frame, which are inclined toward the saddle, perform the automatic function of oil reservoirs.

The cranks of the driving wheel are inclined toward each other at an angle of 360°. The axles and the crank bearing are provided with ball-bearings.

In order to develop a perfectly equal power and avoid the dead centre a back-puller of rubber is employed which can be regulated in traveling up hill. Between the front wheel and the double cylinder and directly attached to the latter is an apparatus to facilitate the evaporation of the gasolene.

The water reservoir, which is constructed in a circular form above the driving wheel, is directly connected with the double cylinder and cools it. The rear wheel being in motion can at the same time act as a ventilator, so that it is not necessary to renew the water frequently.

The seat is adjustable, as in the ordinary bicycle, but is generally so low that the feet of the rider can easily reach the floor. During the ride the feet are placed on adjustable foot rests situated on both sides of the machine.

The common bottom brake works on the front wheel. The use of the brake causes the stopping of the motive power when the piston rods of the cylinder operate as pneumatic brakes on the driving wheel. This system ensures a certainty of stopping the machine.

Steps have been taken to organize a company to manufacture the machine in this country.

Frank S. Allen, of 136 Liberty Street, New York, also had an exhibit of his "Portable Electric Propeller for Boats," which is said to be adapted to boats 10 to 18 feet in length. The weight of the entire apparatus is 35 pounds, and the speed attained is from three to five miles an hour. The device can be attached to any boat, and can be shifted from one boat to another in a few minutes.

It consists of a hollow tube or shaft hinged at the stern of the boat. At the extremity of this shaft is the propeller, and on the under side is the rudder. The motor is at the other end of the shaft, while the batteries, which supply the current, are placed in the bow of the boat. These weigh from 100 to 275 pounds, but being in four parts are easily handled.

Further Details of the Paris Race.

The committee of the Automobile Club having in charge the arrangements for the race from Paris to Marseilles and return met last month at the house of Count de Dion, vice-president of the club.

The course was finally decided upon as follows:

Paris, Melun, Montereau, Sens, Joigny, Auxerre, Avallon, Vitteaux, Sombernon, Dijon, Beaune, Châlon-sur Saône, Lyon, Vienne, Valence, Montélimar, Orange, Avignon, Orgon, Salon, Aix and Marseilles.

The stopping-places (for it has been thought best to allow no night runs) will be Auxerre, Dijon, Lyon, Avignon, and Marseilles. Parks will be secured in each of these cities where the vehicles may be quartered for the night. No repairs will be permitted during these night stands; all repairs must be made *en route*. The signal for the start will be given each morning at 6 o'clock, and the vehicles will be dispatched at intervals of three minutes.

The race will begin and end at the wood of Vincennes.

The other minor details are not yet agreed upon.

The prizes to be awarded will be divided into three classes: 50 per cent. to vehicles of 2 to 4 places; 40 per cent. to vehicles of more than four places, and 10 per cent. to light vehicles and motor cycles.

The date of the race is not yet fixed.

The Vallee Motor Carriage.

This vehicle, which was exhibited at the last Salon du Cycle at Paris, is of bicycle construction throughout.

The double-cylinder motor, which is a special one designed by M. Valleé, is said to be so balanced as to be without vibration in operation. A two-horse motor is used for one-seated vehicles, and a four-horse for two-seated. Its speed varies from 200 to 500 revolutions.

Four changes of speed are obtained by means of gears, and, as the speed of the motor itself can be changed, all speeds between 3 miles and 15 miles an hour can be obtained. Motion can also be reversed.

Ignition is electric. A special carburetor is employed, which is kept at the proper temperature by the circulation of the exhausting gases.

One of the noticeable features of this vehicle is the method of suspending the forward wheels in forks, as in a bicycle. The lamps at the top of the front tubes turn with the wheels, thus shedding their light directly in the path of the vehicle.

Owing to the length of the frame and the low position of the seat the vehicle has great stability.

The steering and controlling levers are all massed together at the side of the seat out of the way of the occupants.

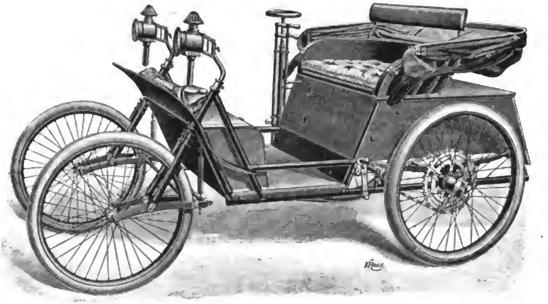
Two brakes are provided, one very powerful one on the main shaft, and the other acting upon the wheels and controlled by the foot.

The pneumatic tires are of a new pattern, designed by M. Valleé, and consisting of a rectangular rim *H*, of light tubing placed between two metal strips, *I* and *J*. The strip *I* is fixed, while *J* can be removed by loosening the bolts by means of which it is attached. *G* is the air chamber, much thicker than in the ordinary pneumatic. *D* is a cloth casing treated with a tar preparation to make it impervious to moisture, and covered with the flexible leather cover *C*, the whole series being secured in place by the steel wires *E*, *F*.

Leather is employed for the cover *C*, in preference to rubber, because of the liability of rubber to dry and crack.

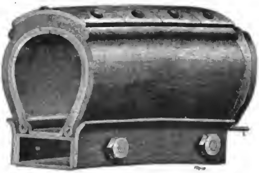
In case of accident to the cover on the road it can easily be repaired by any shoemaker or saddler.

Upon this outer cover is fastened a shoe of hardened leather, *B*, the whole receiving a final protection in the shield *A*, composed of thin sheets of steel placed one upon the other and riveted to the leather shoe.



VALLEE MOTOR CARRIAGE.

This shoe is said to make the tire practically indestructible, without injuring its resiliency, and to fit the vehicle for any roads.



VALLEE PNEUMATIC.

The one-seated Valleé carriage weighs something over 500 pounds, and the two-seated about 850 pounds.

Company to Exploit Motor Patents Organized in London.

A company with a capital of $750,000 has just been organized in London to exploit motor vehicle patents. Wishing to put upon the market practical motor vehicles at reasonable prices, the society has advertised a competition on the following terms:

Class I.—Motor vehicles for family use, reasonable in price and easily operated. Prize, $50,000.

Class II.—Motor vehicles for agricultural purposes and general transport of merchandise. First prize, $15,000.

Class III.—Light vehicles for three or more persons, of simple construction. Prize, $5,000.

In addition to the prizes the winners will receive stock in the company to the amount of $50,000 for the first class; $35,000 for the second class, and $20,000 for the third class.

Every contestant will be allowed to compete in one or more of the three classes.

The judicial code under which the awards will be made is as follows:

Class I.—Safety, durability, ease of control, cost, freedom from objectionable odors, noiselessness and appearance.

Speed will not be considered under this head, although a time limit may be imposed.

Class II.—Safety, durability, ease of control, cost, range of utility.

Speed and appearance are regarded as of no consequence.

Class III.—Safety, durability, ease of control, speed, lightness, appearance.

The machinery should be so situated as to be readily accessible in case of accident.

The successful vehicles and the patents under which they are constructed will become the exclusive property of the company.

Each competitor is required to purchase five shares of the company's stock at $100 a share before he can qualify for the competition.

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English champions of the horse have been spurred to action by the zeal of the promoters of the motor vehicle. They have been holding meetings, too, and will try to devise some means of stemming the rising tide of popular approval of the new vehicle.

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The Motor Car Club has opened rooms at 40 Holborn Viaduct, London.

Mr. Kuebler's Observations in Europe.

Fred Kuebler, vice-president of the Daimler Motor Co., of Steinway, L. I., recently returned from a four-months' stay in Europe, during which he visited London, Paris, Cannstatt and other centres of motor interest there. In an interview with the editor of THE HORSELESS AGE he gave most encouraging evidence of the growth of the motor movement.

In London he reports a great awakening. The banquet given by the Motor Car Club last month to members of the House of Commons has drawn the attention of the legislators to the unreasonable restrictions which now stand in the way of the adoption of the motor vehicle, and these restrictions will doubtless soon be removed. After the banquet the lawmakers inspected a number of motor carriages in actual operation. The Prince of Wales also honored the Motor Car Club with his presence, and showed a lively interest in the vehicles. Being asked what steps had been taken in London toward the manufacture of motor carriages, he replied that the Daimler Motor Syndicate, a company organized to manufacture vehicles under the Daimler patents in the British Isles, found its capital stock of £60,000 oversubscribed a few days after the books had been opened. This company would proceed to turn out Daimler carriages, boats and stationary motors as soon as facilities could be secured. At the time of his visit, he said, they had not decided whether they would build a new factory or find some plant which could be adapted to their purpose. By special agreement with Mr. Daimler they are now getting all their vehicles from Panhard & Levassor or Peugeot Freres, the well-known French builders. The English company paid the Daimler Motor Company 350,000 marks for the English rights.

The state of the industry in Paris is most flourishing, according to Mr. Kuebler. Panhard & Levassor have quadrupled their force of workmen, and still find it impossible to deliver any vehicles inside of four or five months. They now run about 90 hands. Peugeot Freres, another large firm making a specialty of Daimler carriages of the bicycle style, are about to erect a large addition to their plant at Valentigny, which they will devote exclusively to this growing branch of their business.

In Cannstatt, the home of the Daimler Motor, Mr. Kuebler met with the same signs of growth and prosperity. New kerosene motors are being built for vehicles, boats and stationary purposes. Motors for work wagons are also being made of as high a capacity as 16 horse-power, and for marine and stationary work 30 horse-power motors are now being manufactured.

A very interesting celebration at Cannstatt, in which Mr. Kuebler was fortunate enough to take part, was a banquet held to commemorate the completion of the 1,000th motor at the Daimler works. About 400 of the employees and prominent men of the town assembled to do honor to the occasion. One of the features was a group of souvenirs, showing the progress of the past eight years. This group included the first and second motors built at the works, in close contrast with the 1,000th, and the first model of a motor vehicle made by Mr. Daimler, contrasted with one of more recent date, on which Peugeot Freres based their experiments.

Not less interesting than the above was a picture of the little green house in which Mr. Daimler first conducted his experiments when he came to Cannstatt. Owing to the secrecy he observed in his work, and the strange noises emanating from the workshop, Mr. Daimler's neighbors became suspicious and government detectives shadowed him, under the impression that he was a counterfeiter.

Mr. Kuebler assisted Mr. Daimler in his experiments at this time, and has been associated with him ever since. Mr. Kuebler brought over with him one of Panhard & Levassor's Daimler carriages, a handsomely finished one with canopy top, solid rubber tires, low wooden wheels, and a 4 hp motor placed in the rear.

This vehicle was exhibited at the Sportmen's Exhibition at Madison Square Garden, March 16 to 22d, and will be seen about the city when pleasant weather comes.

New developments are promised at the Cannstatt works in a very short time.

Current Canadian News.

There has been a great deal of interest displayed in the widespread Canadian exhibition of horseless vehicles for some time past, but that interest has not yet taken the form of a definite announcement of dates and prize lists. It was expected the full announcement would have been made by this time, but politics have been to blame. Hamilton, Ont., will be the scene of the exhibition in all probability, but the authorities of the city have not yet made any appropriation for the purpose, as they have had their hands full looking after the interests of the city in both Ottowa and Toronto, where Parliament and Legislature are sitting and bills concerning the cities' welfare are under discussion. It is expected that inside of a week, however, the necessary appropriations will be made and the program and prize lists published. Montreal cannot have the race, and it has been decided that she does not want the Colonial Exhibition which promoter Styles was arranging.

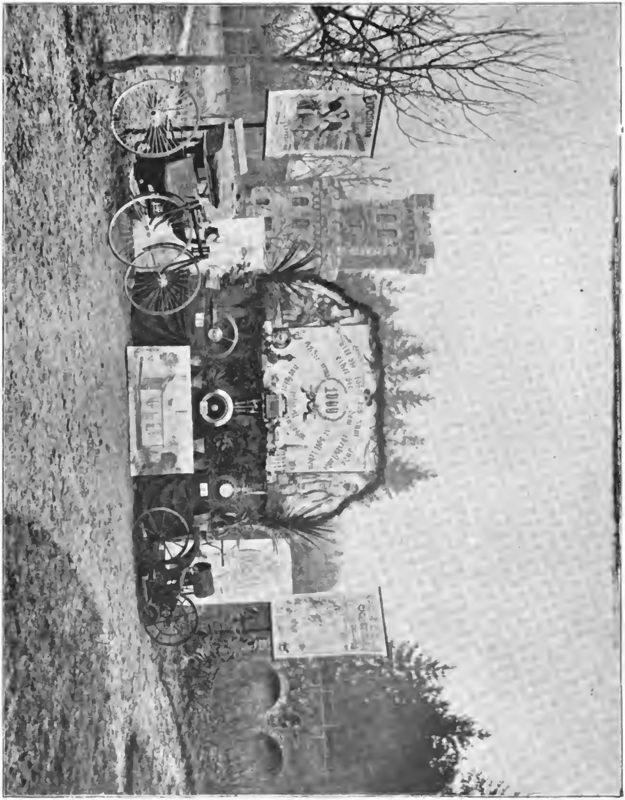
A publishing house which had done a lot of advertising has assigned, and a number of people who had paid for their concessions in advance are looking about to see where they stand. On the whole, the demand for exhibitions in Montreal at present is weak.

Hamilton is very well situated for the exhibition, has a fine park to make the start and finish and a population that enters heart and soul into any public spectacle or sporting event. The distance from Buffalo is trifling, and the facilities for access both by rail and boat are excellent.

One feature of interest in connection with the proposed introduction of motor wagons in British Columbia is the great opposition made by horse owners and users to the appearance of the new bearers of burdens upon the public roads. Petitions have been presented to the British Columbia Legislature, and no effort will be spared to prevent the advent of anything which will interfere with horseflesh.

Names for Horseless Vehicles.

The term "motocycle" is considered a literary abomination, similar to "electrocute" and "motorneer." A more proper general term would be "motor wagon," and for special styles of the vehicle the terms motor cart, motor carriage, motor coach, motor phaeton, motor bicycle, motor tricycle, etc. The suggestion seems to be a very good one, and well worth following, as self-explaining terms are always to be preferred to those whose meaning would have to be looked up in a dictionary.—*Popular Science News.*



MEMORIAL GROUP COMMEMORATING COMPLETION OF 1,000TH MOTOR AT THE DAIMLER WORKS, GERMANY.

International Exhibition of Motors and Congress of Motor Industries.

Full Prospectus, Rules and Regulations.

As already announced in THE HORSELESS AGE, an international exhibition of motors and motor vehicles will be held at the Imperial Institute, London, under the direction of the Motor Car Club, during the months of May, June, July and August, opening on May 9.

The main sections of the prospectus are reprinted for the information of our American readers :

Advantage will be taken of this special opportunity, to enable British, Colonial and foreign manufacturers and patentees of motor carriages, vehicles, cycles and motors, whether propelled by oil, steam, electricity, compressed air, or otherwise, to display their productions and inventions for the inspection of the general public, with a view of giving, by means of examples and the daily practical demonstration of steering power and speed tests, an interesting illustration, more especially of the capabilities of the new motor car industry.

The special aim of the exhibition will be the display of the recent developments in self-propelled traffic. The exhibition will include examples which may be received from the United Kingdom, the Colonies and India, or from foreign countries.

One gold and three silver medals, and diplomas, will be awarded by competent jurors or experts, to such exhibitors in each department or section as may be deemed entitled thereto. The jurors or experts will be empowered to award medals, in addition to the diplomas, should they deem the exhibit of sufficient merit.

Special attention is directed to the fact that where medals are offered as prizes and are awarded by the jurors or experts, they will be presented to the exhibitor without any payment.

The judging will take place as soon as possible after the opening of the exhibition, so that successful exhibitors may receive the full benefit of their awards.

Suitable buildings will be provided in the grounds of the Imperial Institute for the purposes of this exhibition. The cost of these buildings, including the provision of lighting, general control, and care for the four months named, would be equivalent to an outlay of 5s. per square foot.

The exhibition will be open to the public during the months named, in conjunction with the Collections of Colonial and Indian National Products of the Imperial Institute, and the superb collection, made by H. R. H. the Duc d'Orleans, of specimens of natural history, dresses, arms, and fabrics, principally from various dependencies of the British Crown. The public will be admitted to the Institute galleries and grounds and the exhibitions on Mondays, Tuesdays, Thursdays, Fridays and Saturdays, from mid-day to 11 p.m., at one shilling each person; on Wednesdays the buildings and grounds will be reserved for Fellows of the Institute, and for friends specially introduced by them, in accordance with the regulations, from mid-day to 11:30 p. m.

Scope.—The exhibition is intended to include the display of appliances and inventions under the following sections:

SECTION 1.

Motor pleasure carriages propelled by:

1. Steam.
2. Oil.
3. Electricity.
4. Compressed air.
5. Springs.

SECTION 2.

Self-propelled vehicles employed on roads for trade purposes and for transport of goods, the motive power being any of the means above indicated.

SECTION 3.

Self-propelled ploughs and other agricultural implements.

SECTION 4.

Self-propelled cycles, the motive power being any of the means above indicated.

SECTION 5.

Wheels, tires, axles, springs, seats, cushions, and the various parts used in the construction of the above three classes or of the machinery connected therewith.

SECTION 6.

Apparatus for aerial navigation, through the agency of motors.

SECTION 7.

Examples of carriages and vehicles not self-propelled.

SECTION 8.

Cycles, not self-propelled, which embody some novel principle of construction.

SECTION 9.

Road maps, hotel and railway guides, and books of views for the use of tourists.

SECTION 10.

Knapsacks, portmanteaus, cooking appliances, tents, picnic baskets, and other tourists' conveniences.

SECTION 11.

Launches, yachts, and boats propelled by :

1. Steam.
2. Oil.
3. Electricity.
4. Compressed air.

SECTION 12.

Lamps and approach signals, as applied to carriages and other road vehicles, and to launches, yachts and boats.

SECTION 13.

Watches, clocks, compasses, pedometers, and other travelers' requisites.

SECTION 14.

Stationary engines, dynamos and motors.

SECTION 15.

Models of inventions, working and otherwise, in connection with the foregoing.

Exhibition Space.—The floor area of the special buildings will be allotted at a charge of 5s. per square foot. The wall at the sides and ends of the buildings provide for exhibiting space of nine feet above the floor. This wall area will also be allotted at a charge of 5s. per square foot.

Liabilities of Exhibitors.—Exhibitors will incur no liability for expenses in connection with the general administration of the exhibition, beyond the agreed charges for space.

Latest Date for Reception of Exhibits.—All exhibits, cases, fittings, etc., must arrive at the Imperial Institute not later than noon on Monday, April 27. They may be sent in from Monday, April 20. The exhibits whether in cases or uncovered, must be installed and arranged, not later than noon on Monday, May 8.

They should bear the distinctive mark
and should be addressed:

IMPERIAL INSTITUTE,
(Prince Consort Road entrance)
LONDON, S. W.

GENERAL REGULATIONS.

First: The Motor Car Club Syndicate, Limited, (hereafter called the Syndicate), reserves the right of refusing to admit to the Institute premises, any cases, fitting or exhibits arriving after noon on April 27; and to remove from the exhibition gallery, at the cost of the exhibitor, any exhibits, cases, or fittings, the arrangement of which may not be completed to the satisfaction of the administrative committee by noon on May 8. In such cases the syndicate reserves the right to dispose of the available space at their absolute discretion.

Second: The acceptance by a manufacturer (firms, companies, or individuals) of the invitation to exhibit, and the allotment of space to him, will be taken as consent on his part to allow all his exhibits, cases and fittings to remain undisturbed in the exhibition galleries until the close of the exhibition (approximately some time toward the end of August), and, further, as an agreement to abide by the regulations here set out.

Third: The Executive Council of the Institute and the Syndicate, while undertaking to supply adequate general control, watching and care, accept no responsibility or liability as regards the exhibits in respect of damage or loss by fire, accidents, or otherwise; and exhibitors must effect their own assurances against loss or damage by fire.

Fourth: Exhibitors will be required to keep their stands and exhibits properly cleaned and in good order, and displayed for exhibition, during the whole period of the exhibition when open to the public.

No sales of exhibits will be allowed in the Exhibition Building, but exhibitors will be permitted to have their own attendants, to take orders for articles, and to distribute their circulars or trade cards, but so that orders shall not be solicited to the annoyance of the public, and subject to copies of the circulars being previously deposited for the approval of the Administrative Committee. Notices, handbills, and circulars of every description will be subject to the approval of the Administrative Committee.

Fifth: Screens, cases, or other erections must not exceed eight feet in height, except special permission is accorded for increasing this altitude.

Cases must be unpacked as fast as possible and the empty cases taken away by the exhibitors or their agents. The syndicate decline to accept any responsibility with reference to empty cases and litter, which must be at once removed from the building at the expense of exhibitors.

No exhibitor will be allowed to transfer any allotment or portion thereof, or to allow any other than his own duly admitted exhibits to be placed thereon, except by permission of the Administrative Committee, and all such exhibits must be in the name of the person whose name appears on the application form.

Sixth: No articles exhibited may be photographed, drawn, copied or reproduced in any manner whatsoever without the special sanction of the exhibitor and of the Administrative Committee.

Seventh: The syndicate reserve to themselves the sole right of compiling a catalogue of the exhibits.

Eighth: Passes to the exhibition will be granted to exhibitors and to a reasonable number of attendants. If these passes are used by any but those to whom they are issued they will be immediately canceled.

Ninth: Applications must be sent in not later than March 31. This form should indicate the actual minimum space which the exhibitor would accept, and also the maximum space he would desire to have alloted, in the event of the sydicate being able to meet his application in full.

A check, equivalent to the charge for the floor or wall area (respectively at the rate of 5s. per square foot), must accompany each application, and be made payable to C. Harrington Moore, Esq., secretary, the Motor Car Club Syndicate, Limited. The syndicate reserve absolute right to forfeit any sum paid for space, in the event of any applicant failing to exhibit in accordance with his application and these regulations.

Tenth: If no allotment is made, the amount of the check will be returned in full.

If only the minimum space desired should be allotted, then the difference in value of the check between the minimum and the maximum space applied for will also be returned.

Power is reserved to refuse all applications, in which case the whole of the amounts transmitted on account of the required space will be returned in full.

The syndicate reserves the right, in the event of the space applied for considerably exceeding the accommodation available, or for other cases, to allot space only to certain of the applicants.

Eleventh: Each exhibitor respectively shall at all times indemnify the syndicate, their contractors and others, from and against all liability, loss or damage whatsoever, caused by or through the acts, negligence, or misconduct of himself, or any person or persons employed by or for him, or acting under his directions. Each exhibitor respectively shall also at all times reimburse and indemnify the syndicate, their contractors and others, against any action, suit, claim, costs, charges or expenses for or in respect of any damage or injury caused or occasioned, or alleged to have been caused or occasioned, during the exhibition by any exhibit, machine, conveyance, ladder, tool, or other appliance belonging to or used by him or on his behalf, or by any person or persons employed by or for him, and shall in all respects conform to the requirements of the said syndicate in dealing with such or any claims.

Twelfth: The exhibition will extend from May 9 to Aug. 8, and will be open between the hours of mid-day and 11 p. m., or such other days and hours as the Executive Council of the Institute may at any time or for special days determine.

Thirteenth: All exhibits shall be subject to a lien for any amount which may be due to the syndicate.

Fourteenth: All questions or disputes, either with reference to these regulations or otherwise, shall be decided by the Administrative Committee.

Motor Mail Wagons.

The Post Office Department has decided to introduce motor mail wagons into the service. Particulars are not ready for publication yet, nor has it been decided where they will first be tried. Second Assistant Postmaster-Gen. Nellson has the matter in charge.

The Gardner Motor.

The accompanying cut represents the Gardner Motor, invented by Levi S. Gardner, of New Orleans, La., patented in the United States and foreign countries, and manufactured by the Gardner Motor Co., "Limited," 215 Carondalet street, New Orleans, Jefferson C. Wenck, president.

The type of motor is original, the distinctive features being simplicity, double impulse, lightness, etc. The only moving parts are the connecting rod, piston and crank shaft.

The extra lightness of these moving parts and their direct action on the crank make it possible and practicable to obtain high speed with very little vibration.

In this motor there is no noticeable noise. The base consists of an air-tight enclosure of the original parts which contribute largely to this result. The construction also ensures a rigid base, important in a gas engine, secures perfect lubrication of all the moving parts, and at the same time prevents oil from being scattered about where it is not wanted.

Upon the base is mounted the double impulse cylinder; the pump in the base is so timed that it delivers the charge of mixture to the power cylinder when the power piston is passing the upper and lower centres and the burnt gases are being exhausted into the atmosphere. After the charge is delivered to the power cylinder it is compressed to 60 pounds to the square inch and ignited by the Gardner automatic igniter, a new igniter, which is claimed to be perfect, and expands to a pressure of 300 pounds to the square inch. The cylinder is 3 by 5, double acting, and has an expansion at each end of the stroke. The working speed of the motor is 600 revolutions per minute; its height is 28 inches and its weight 150 pounds. It is claimed to develop 6 horse-power.

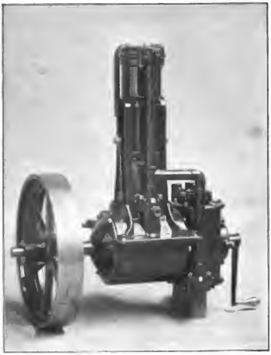
In the ordinary gas engine an impulse is received at every second revolution of the crank shaft when running up to full capacity, and at every fourth or sixth revolution, if the load is small. In the Gardner motor two impulses are received at every revolution, the intensity of the force being exactly proportional to the load, by the action of the governor upon the admission valve, precisely the same as in the high grade steam engine.

It is a fact well known by all persons familiar with the theory of hydrocarbon motors, that the quantity of air and gas to be admitted to the cylinder must bear a fixed proportion to each other in order to obtain the highest efficiency from the explosion of the mixture. By the use of a specially designed governor and mixing valve, this result is perfectly secured and a uniformity of motion is obtained under all variations of load.

The valves are all automatic poppet valves, and there are no counter shafts, gears, cams or levers to get out of order or require delicate adjustment. The exhaust valve through which the burnt gases are expelled, and which is liable to become clogged and to leak, is entirely done away with. The cylinder is lubricated by a single oil cup, and the crank and pump are lubricated by running in oil and water, the crank pin and boxes splashing into it at every revolution.

The explosion chambers are surrounded by the water jacket and are kept cool by a small quantity of water circulated through it, the water being taken from a tank and circulated by gravity in stationary engines, while in portable engines it is circulated by a small automatic pump.

The motor is started by a crank handle on the main shaft, having an automatic clutch which engages the shaft as the crank is turned in the act of starting the engine, and automatically releases the handle as soon as the engine starts.



GARDNER GASOLENE MOTOR.

The points of excellence claimed for this motor may be briefly presented as follows:

Simplicity, lightness of moving parts, high speed, economy, close regulation, absence of internal friction, automatic lubrication, and extreme lightness, less than 25 pounds to the horse-power.

The Gardner igniter, of which brief mention has been made in this article, will be fully described in a later issue. It is said to fill a long-felt want, allowing the spark or tube to be discontinued, and the engine to work without apparent ignition. It is said to use less gas, give more power, and never to miss an explosion.

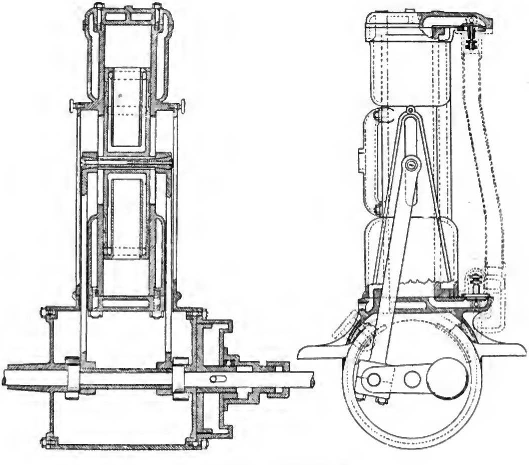
The inventors of this motor have also under way a new regulating device for controlling the speed of motor vehicles continuously, and without breaks or jumps in the scale.

A new valve to govern the speed of gas engines is also in preparation, and will be described in due time.

Liberality of the New English Law.

The new bill which has been introduced in the English Parliament to take the place of the "road locomotive" act is very favorable to the new industry. Though based on the lines of Mr. Shaw Lefebvre's bill of last year, it takes a still more liberal view. No limit of speed is imposed, cases of recklessness being left to be dealt with by the laws now in force against fast driving.

The English law will therefore be more favorable to the new industry than the law now in force in France. No opposition is looked for from Parliament, as most of the members are friendly to the new vehicle, and upon its passage an immediate increase in the number of motor vehicles on the streets is predicted.



DIAGRAMS OF GARDNER MOTOR.

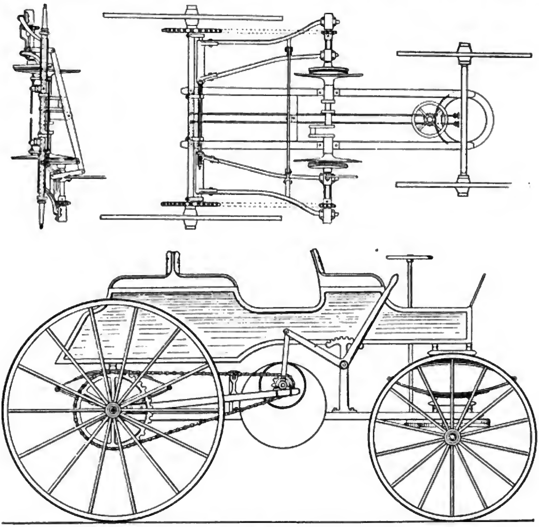
Variable Speed Power Transmitting Device.

The E. & B. Holmes Machinery Company, 59 Chicago Street, Buffalo, N. Y., have a variable speed gear which they are offering for motor wagons.

The cuts do not represent any particular style of wagon, but simply show how the device can be applied to any motor wagon.

The blue print shows the wagon gearing only as applied to a shaft with a smooth turned disc on each end of what we will suppose to be an engine shaft. Two other discs are provided, which have rings raised on their inside faces, of suitable frictional material. The shafts of these discs are mounted in suitable boxes with steel ball bearings, and have a sprocket wheel on each shaft, which is connected by a chain to the sprocket on the hub of each rear wheel. These last-described discs are called friction discs. Their shafts are placed on swinging or movable frames, so that they can be easily moved across the face of the driving disc, or away from it, and although running nearly in line with the engine shaft, the friction disc can only come in contact with the driving disc on one edge, so that there is but little wear on the disc, while their holding or driving power when in contact is very strong. It will seen that when the contact part of the driven disc is moved near the centre of the driving disc it must be revolving comparatively slow, its speed being increased as it is moved toward the periphery of the driving disc. It will also be seen that by moving the friction disc so that its contact part is brought to the opposite side of the driving disc, the motion will be reversed and the wagon be driven backward fast or slow, as may be desired, and by moving the friction disc away from the driving disc, the power is entirely disconnected and has no action on the movement of the wagon.

There is no necessity of stopping or changing the motion of the motor in order to stop the wagon or regulate its speed, as



VARIABLE SPEED POWER TRANSMITTING DEVICE. E. & B. HOLMES MACHINERY COMPANY, BUFFALO, N. Y.

this is all controlled by the easy and reliable movements of the friction gearing or discs.

The friction discs are shown one on the lower side of one of the driving discs and the other on the upper side. By this arrangement the weight of one disc balances the weight of the other so that their movement up or down is perfectly easy. Either of the friction discs can be moved from contact with the driving discs without affecting the other. This is considered quite important in turning corners or turning the wagon, as the wagon can be propelled either backward or forward by driving either or both wheels.

Perfect control of the wagon by the operator is made very complete and is simple and effective. There is nothing that can get out of order. A kit of tools and an expert is not necessary. If the suitable power is furnished, the device is claimed to do the rest, without necessarily adding to the weight of the wagon, for the friction discs running in the same way with the driving disc and being in contact with these discs, act also as balance wheels so that the weight of the discs can be taken from the weight of the balance wheels.

To make the application and action of this variable speed friction gearing more easily understood, a blue print is added showing the side view of a wagon with gearing applied, by which a speed of from three to twenty miles an hour can be given to a wagon by running a motor 300 turns a minute. Greater or less speed can be had in the same proportion by increasing or decreasing the speed of the motor.

Barnum & Bailey Lead the Procession.

Barnum & Bailey have come to town, and with them a new attraction—no less than a new model Duryea motor wagon, which they will introduce in their opening parade, exhibit in operation at Madison Square Garden, New York, beginning April 2, and take with them on their annual tour through the country.

Brilliant posters, large and small, in which the winner of the Chicago race is the central figure, confront the New Yorker at every turn, and cast the familiar lions, tigers, acrobats and equestrians into the shade.

It is expected that the motor wagon will be a centre of interest everywhere, and in its effect upon the general movement the billing and exhibition of this vehicle marks an important era. The enterprising showmen are entitled to the thanks of all who have the progress of the new invention at heart.

Motor Buggy Tested at Pittsburg.

A public test of a motor buggy was recently made at Pittsburg, Pa., by William Morgan, manager of the Empire Motor Co., and E. W. Walker, machinist for the Pennsylvania Railway Supply Co.

The buggy was an ordinary side-bar Brewster, weighing 260 pounds and fitted with pneumatic tires.

The motor is of the gasolene type, generating 1½ horse-power, both motor and supply tank being concealed from view under the seat.

Speed is regulated by a friction wheel on the drive shaft.

Power is transmitted by a sprocket and chain.

One lever steers and regulates speed.

The test was considered quite satisfactory, but Mr. Morgan is at work upon a new double cylinder gas motor which he hopes will give as steady power as a steam engine.

Motor Vehicles to Be Introduced in Baltimore.

It is quite probable that motor vehicles will soon be used in the City of Baltimore. A bill has been introduced in the Maryland House of Delegates to incorporate the Lexington Company to manufacture, sell and operate motor vehicles for hire in the City of Baltimore.

The incorporators are W. H. Matthai, Henry Reike, James F. Ingram, G. W. Knapp and W. H. Jones.

According to its articles of incorporation the company has authority to use motor vehicles propelled by other than steam power, provided they are noiseless and equipped with a suitable alarm by day and lamp by night. The vehicles may be patented or not. The capital stock is $10,000, which may be increased to $100,000.

The prime mover in the enterprise is W. H. Matthai, of the well-known firm of Matthai, Ingram & Co., manufacturers of stamped ware, etc. Mr. Matthai resides at Lexington, a suburb of Baltimore, and experiments will be begun with a light pleasure carriage between that suburb and the city. If this proves as satisfactory as expected, the company will enter into the manufacture of motor vehicles on an extensive scale, putting into service public stages and cabs to compete with street cars.

The motive power will probably be oil.

Mr. Matthai will at once adopt a motor carriage as his private conveyance from his residence to his place of business.

Keely to Apply for a Patent.

A COMMITTEE REPORTS THAT THE MYSTERIOUS MOTOR IS AT LAST READY FOR BUSINESS.

(Special to the N. Y. *World*.)

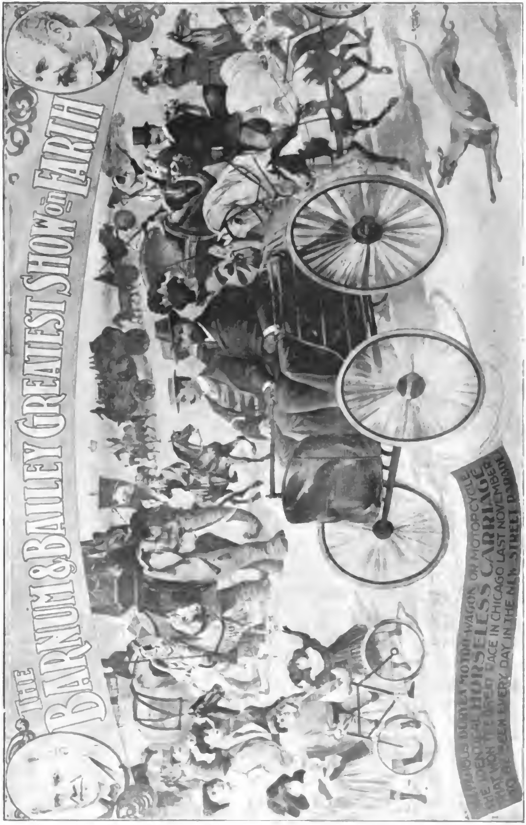
PHILADELPHIA, March 2.—When the Keely motor stockholders met to-day to hold their adjourned annual meeting they received a report from a committee on reorganization which set forth that the inventor has succeeded in harnessing a real force in a real manner, and that as soon as he recovers from the effect of a recent accident he will apply for letters patent.

After reciting that Mr. Keely and the committee had made counter propositions on the question of reorganization, the report continued:

"Previous to the accident Mr. Keely exhibited to the committee his first circuit engine connected to and operating a device termed by him his vibratory dynamo machine. This power was transmitted from the engine to the dynamo by means of a belt. The experiment was highly successful, and demonstrated to the board that Mr. Keely had been successful in getting such control over his discovery as to entitle him to letters patent covering broadly his process and the machinery employed in producing it.

"Such plan of reorganization as may be recommended by the committee to the board and by the board to their stockholders will be based on the application for letters patent, which will be made by Mr. Keely at the earliest possible period. Until this is done it would be idle to suggest or discuss any plan of reorganization."

This report was favorably received by the board, and the meeting adjourned until April 2.


THE
BARNUM & BAILEY GREATEST SHOW ON EARTH
THE FAMOUS DURYEA MOTOR-WAGON OR MOTOCYCLE
THE IDENTICAL HORSELESS CARRIAGE
THAT WON THE GREAT RACE IN CHICAGO LAST NOVEMBER
TO BE SEEN EVERY DAY IN THE NEW STREET PARADE

BARNUM & BAILEY'S POSTER ANNOUNCING THE EXHIBITION OF THE DURYEA MOTOR WAGON.

The Motor Carriage Not a Traction Vehicle.

BY M. H. DALEY.

Many people seem to think it impossible to produce a practical self-propelled vehicle. I often hear the question: What can it do on muddy roads, slippery tracks, or steep hillsides?

Let us examine the principles on which power is exerted by the horse in drawing a carriage, or in propelling itself with a load upon its back, and compare them with the application of power to the motor carriage.

The horse draws a vehicle by the friction of its feet upon the ground. This is not the case when the horse propels only its own body, or even a load upon its back. In the latter case, the horse places its feet upon the ground and moves its body forward by muscular effort. The load upon its back is carried forward with the body by changing the pivotal relation of the legs at the point of union with the body, just as a wheel at its hub. The other joints of the horse's leg are only for the purpose of shortening and lengthening the leg, so that the body may not have to rise and fall at every step, and the hoof may adjust itself to the surface of the road and remain so while the leg changes the angle at which it stands in supporting the body.

When a horse is drawing a vehicle the forward motion is produced by the same muscular effort. But the resistance of the vehicle has a tendency to produce a slipping of the horse's feet upon the ground. The same is true of traction engines when hauling loads such as plows or wagons. There is a tendency to slip the wheels upon the ground.

A motor carriage that is driven by revolving the hind axle or hind wheels acts upon the principle of a horse carrying a load upon its back, and, with the exception of the weight, which rests upon the forward wheels, there is no slipping tendency at the point of contact of the wheels with the ground. The change of the pivotal relations of the wheel at its hub is practically the same as the action of the horse; but, the wheel being raund, there is a continual moving forward of the point of contact, instead of at intervals, as is true when the horse moves his foot forward to take another step.

If the rim of the wheel were removed the spokes would act as legs on which the vehicle would walk by the power applied to change the relation of those legs to the body of the vehicle at the hub or pivotal point.

As action or reaction is the same, the power applied to turn the wheels is applied in the opposite direction on the body of the carriage.

The pressure against the head of the cylinder is always lifting the forward wheels and has a tendency to revolve the body of the vehicle in the opposite direction to the wheels. This reactive power has a tendency to lift the weight off the front wheels and put the weight upon the hind wheels in proportion to the power required to propel the vehicle; consequently on bad roads the weight is mostly upon the hind wheels that are driven.

From a careful study of these facts it will be seen that there is scarcely any tendency to slip the wheels, the action being the same as that of the horse carrying itself and not the tractive action, as generally supposed.

All persons accustomed to the use of machinery will readily see that all that is necessary to drive a carriage forward is the application of power to revolve the wheels. It is as easy to revolve the wheels of a carriage in motion by power as to revolve the wheels of a carriage if stationary; just as easy and practical to turn the wheels of a carriage as to turn a grindstone or any machine. With the motor in the carriage and the mechanism necessary to connect the power to rotate the wheels of the carriage, there is no question about the forward motion of the vehicle as there is no tendency to slip. The vehicle can be pushed through mud six or eight inches deep, if there is sufficient power to revolve the wheels. The resistance to the wheels would be equal to rolling them up hill.

There is no more tendency for a wheel to slip in rolling up hill than on a level, except the tendency the wagon would have to slip down hill if standing on the hillside with the wheels tied to prevent them from rolling.

The same is true of the power to propel the motor carriage on ice or snow. If all the wheels of the carriage were driven it would travel on the smoothest ice without slipping as readily as on the ground if the ice were level and there were no wind to resist.

The power of the motor carriage to go forward over slippery roads is far greater than the same power of the horse to draw the carriage over the same road, for the reason that the motor carriage is not moved forward by traction, as is the case when the carriage is drawn by the horse.

Again let me give this fact: *There is no more tendency of the wheels of a motor carriage, all wheels of which are driven, to slip in traveling than there is of the wheels of a carriage drawn by a horse.*

A pair of ordinary horses and a carriage for carrying two people usually weigh 2,500 pounds. When muddy roads are met with the horses not only have to exert more power to draw the carriage, but also additional power to propel themselves through the mud. If a motor carriage weighing only from 200 to 800 pounds meets with bad roads, less additional power is required to propel the motor carriage than is required of a span of horses drawing an ordinary carriage.

Here comes a vital point for consideration: The horses go slow when a bad piece of road is met, and exert only about the same foot pounds of power per minute. In other words, they gain power by reducing speed, exerting about the same power per minute, and perhaps a little more for a short pull.

In the motor carriage it is necessary that the motor run at a uniform speed, and the mechanical application of the power be such as to move the wheels of the vehicle at any rate of speed from the greatest speed at which it is safe to travel down to the slowest speed that can be noticeable. Thus we get power at the expense of speed on bad roads. By this method a three horse-power motor can be made to exert a pull of 10 or 12 horse-power, or even more, and the pull would be reduced as speed would be attained.

There is no question as to the propelling of the motor carriage. The variable speed and ease of guiding or steering the vehicle so as to avoid obstructions are the essential points to be considered after we have secured a suitable motor.

◆

The Latest Steam Wagon in Boston.

George E. Whitney, designer and builder of marine engines, East Boston, Mass., is about completing a four-wheeled steam vehicle, the fifth that he has so far designed.

The front wheels are 30 inches in diameter and the rear ones 34 inches. All are of wood, and are fitted with 2-inch pneumatic tires.

The boiler is 14 x 20 inches, and contains 340 half-inch copper tubes, 13 inches in length.

The engine is double, and has 2 x 4 inch piston valves. It is reversible and is geared to the hind wheels, 2 to 1.

The boiler is built for 125 pounds of steam, and the engine has cut-off valves at from ¼ to ⅝ stroke.

The fuel is kerosene oil.

The water consumption on a run of 50 miles, over a road so bad that it requires 125 pounds of steam, half stroke, wide open, is calculated to be about 240 pounds. This, so Mr. Whitney states, has not been tried, but he believes his wagon would not be run on so bad a road as to require such an expenditure of power for 50 miles in the State of Massachusetts.

He estimates the average power required as not more than half this, or two horse-power at a speed of 15 miles an hour. He has four horse-power indicated, and can maintain it on a total weight of 600 pounds.

Aeronautical Editor Wants a Motor.

James Means of Boston, editor of the *Aeronautical Annual*, the second number of which was issued this month, has something to say about the growing interest in motors and motor vehicles. He realizes the close connection between the motor vehicle and the aeronautical problem. He says:

"For some time past the editor has been gathering information concerning the gasolene and petroleum motors now on the market. Just at present the market seems to be in a state of preparation.

"The interest in automobile vehicles which has recently been awakened bids fair to result in the development of light motors. For this reason the students of aeronautics are likely to take much interest in the development of the horseles carriage.

"The recent speed-trials in France and in this country show that the carriage-builders are coming forward promptly with their energy and their money; also that the motor-makers have only partially solved the problem of producing a light motor. The full solution, however, is perhaps not far off.

"The editor wishes to obtain for his own use a motor which can lift 550 pounds at the rate of four feet per second; the four-horse-power motor of commerce cannot always do this. Information concerning the exact weight, size and price of motor which can do it will be gladly received."

A Motor Buckboard.

Welch & Lawson, 205 Centre Street, New York, have just shipped to C. S. Fairfield, Portland, Me., a 10-hp kerosene motor, designed for a large buckboard carrying 24 persons, and used for picnic and excursion parties.

This buckboard is 15 feet 6 inches in length, and the wheels are 4 feet and 3 feet 8 inches in diameter, respectively.

The weight of vehicle and motor is 3,200 pounds, and the estimated weight of a full load of passengers, 4,000, making a total weight of 7,200 pounds, which the motor is expected to handle on any ordinary grade without difficulty. On level roads a speed of eight to ten miles an hour is easily attained.

Mr. Fairfield is the pioneer in this line of enterprise in Portland, but he states that quite a number of other citizens of that place are simply waiting for a demonstration of the success of his vehicle, when they, too, will order motors forthwith.

The Construction of a Motor Vehicle.

BY HARRY E. DEY.

When I first considered the design of a motor vehicle it seemed to me foolish to follow along the lines of carriages driven by horses, but when it came to the point of planning one I found it no easy problem to solve without creating a monstrosity, so at last I concluded to let somebody else get up the revolutionary design, and settled down to the electric phaeton shown in the November issue of The Horseless Age. As the motor is placed under the feet and the wheels are small, the carriage has the appearance of being low, although the floor and seat are of the standard height. The wheel base being slightly longer than customary also adds to that effect. The rear wheels should be brought forward several inches and more of a rake given to the front ones.

I think that 26 and 30 inch wheels are the proper size for most motor vehicles, and that wire spokes, pneumatic tires and ball or roller bearings make a good combination. If roller bearings are used they should also be provided with a ball-bearing thrust. The spring type of rollers are probably the best of the cylindrical ones; the solid, conical ones, I should also judge, were excellent.

There are many features of the motor carriage that at present appear odd, for instance, low wheels and large tires (the latter, I think, should be about four inches), but once we become accustomed to them the old style will appear just as odd.

The guiding wheels should have a mechanism to control them that will work only from one end; that is, the end that the driver has hold of. Otherwise, on a smooth road the operator is liable to take his hand off for a moment where the road is good, the wheel will strike a little pebble and the wagon will be turned over into the ditch.

The wheels should also be made to swing so that the inside wheel takes a greater angle than the outer one, the conditions being different than where a fifth wheel is used. A fifth wheel should be used, but it should be vertical to allow of an independent vertical movement of the axles. Tubular gear should be used except for the frame of the engine. Angle steel castings are best for that purpose. The driving wheels should turn independently, and I know of nothing better for that purpose than the differential gear now almost universally used, which is a simple, neat device, and has positive action on both wheels. I think the proper place for it is on the axle instead of the counter-shaft, where, in most cases, it has been placed. Ratchet devices for this purpose appear to me objectionable because the power has to be applied to the inner wheel, which, on a short turn, turns very slowly, or may even be standing still, serving as a pivot.

The power should be applied to the rear axle, as the weight is nearly all taken off the front one when climbing hills. It is true that a sharper turn can be made where the power is applied to the front wheels, as there is then no danger of pushing a wheel sideways, while if the power is at the rear it is not safe to turn the front ones at more than 45°, for the power coming from the rear would force the front wheels over, breaking them to pieces, but I have seen some very sharp, quick turns made even with that angle, and do not think there is any particular object to be gained by steering with the rear ones. To avoid confusion the steering lever should swing sideways in a natural direction.

An electric bell should be used, as the sound is easier located and is not so startling as that of a gong, and the electric bell requires less attention to operate and its current consumption is small.

There should be an arrangement for starting the motor without handling the fly-wheel, which is not only dangerous but inconvenient and uncleanly.

I am inclined to favor five cylinders. If properly designed they add very little to the mechanism, and we can then have every alternate cylinder exploding, giving a constant pressure on the crank-shaft, and making the exhaust practically noiseless, for each cylinder would be so small and the explosions would follow in such quick succession that if they had a common exhaust it would be practically continuous.

The water-jacket is one of the worst features of the present petroleum vehicles, and it seems to me that, if necessary, a considerable sacrifice should be made to do away with it; for instance, by making the motor of three, four, or even more cycles and using several cylinders.

According to Clerk, 51 per cent. of the power is dissipated through the walls of a water-jacketed gas engine.

The sparking should be made with the secondary of an induction coil giving about an inch spark, the secondary being externally short-circuited between explosions. This gives a good fat spark inside the motor when external circuit is broken, and avoids insulation troubles of the open circuit principle. One great objection to an induction coil is the burning of the platinum contacts of the vibrator on the coil and the trouble of getting the proper adjustment there. A good way to avoid these troubles is to screw up the vibrator tight so that it cannot vibrate, and have a make-and-break device on the motor connected to the *primary* of the coil. This will make and break the primary circuit at the proper time for ignition. Causing the secondary to give one very strong spark inside the cylinder, it not only does away with the troubles mentioned, but makes a considerable saving in battery and dispenses with the noise of the vibrator. The ordinary gas lighting coil with a make-and-break inside the cylinder will be found very unsatisfactory because of the burning and smutting of the points which prevent good contact. A considerable lead should also be given to the ignition as it takes some time for the gas to become fully inflamed. An automatic governor should be provided to vary the lead according to the speed of the motor, and the mixture always be kept at a constant proportion (vary the quantity if desired to govern engine). If this is not done it will be impossible to give the proper lead, because this varies with the mixture as well as with the speed. The odor may also be reduced to a minimum by using the proper mixture and igniting it at the proper time. One important item that should not be forgotten is the flame arrester, to prevent the flame passing back to the carburetor. It is made by taking eight or ten layers of copper gauze with 1-16 inch washers laid between them, fastened together and placed between the inlet pipe and suction valve. It works on the same principle as the Davy Safety Lamp.

In electric vehicles one motor only should be used, for it adds largely to the efficiency, one large motor being always more efficient than two small ones, and, besides, experience with trolley cars has demonstrated that electric motors do not work efficiently in pairs, for it is practically impossible to make two motors exactly alike, and a very little difference in them will throw nearly the entire load on one motor, making that one run at a loss because overloaded, and the other the same because underloaded. Cases have been known where one has been acting as a dynamo and consequently as a brake, while the other was doing all the work.

The use of a rheostat should be avoided wherever possible.

How many of our steam carriage inventors have taken into consideration that only licensed engineers are allowed to run steam engines?

Further Details of the "Cosmopolitan" Race.

The managers of the *Cosmopolitan* race have issued a circular, announcing the names of the judges appointed to decide the contest, and making some changes in the code, under which the decision will be made.

The judges are:

Nelson A. Miles, the General of the United States Army; William P. Craighill, Chief of Engineers, United States Army; H. Walter Webb, vice-president N. Y. Central & H. R. R. R. Co.

The code or table of points of merit has been amended as follows:

Speed	35
Simplicity of construction and durability	30
Ease in operating and safety	25
Cost	10

It is reported that the *Cosmopolitan* will hold an exhibition of motor vehicles about the time of the race at the Grand Central Palace, Lexington Avenue and Forty-third Street, New York.

Entries for the contest should be sent to the *Cosmopolitan*, Irvington-on-the-Hudson, N. Y.

The Eureka Motor.

M. H. Daley, of Charles City, Ia., who has made four different gasolene motors for his light motor carriage, has just designed another motor which he considers a triumph, and for which he has made application for a patent.

He uses only one cylinder and a double crank on the driving shaft. One crank is connected to the piston and the other is connected to the cylinder, which moves in the opposite direction to the motion of the piston.

When the gas mixture is exploded the piston is forced in one direction and the cylinder in the opposite direction. The cylinder pulls on one crank and the piston pushes ont he other. This makes an equilibrium of force thrust and momentum, and does away with vibration and friction on the bearings of the drive shaft, usually caused by the thrust of the piston. With one cylinder he claims to get the same effect as is obtained from two cylinders at opposite sides of the drive shaft doing away with half the parts and nearly half the weight.

He claims that no two cylinders can be made to work together, both exploded exactly at the same time, with exactly the same force, and hence there is more or less vibration; but that one cylinder, twice the length or a little less (the piston and cylinder weighing the same and both moving in opposite directions), having only one explosion, must exert the same force in both directions at exactly the same instant, doing away with vibration and strain on bearings and frame, all of which he builds lighter.

Mr. Daley calls it the "Eureka," believing he has at length found what he has long sought.

A further description, with illustration, will appear in a future number of this journal.

The System of the American Carriage Motor Company.

The American Carriage Motor Company, of New York, recently organized, are placing upon the market a novel form of motor and mode of vehicle construction.

The cylinders, four in number, are placed horizontally upon a frame of steel tubing, 1½ inches in diameter. The cylinders are arranged in two pairs, the crank shafts being 180 degrees apart, and the second set of cylinders are arranged 90 degrees apart from the first ones, thereby giving an explosion every half revolution of the crank shaft.

The motors are of the two-cycle type, but a novel feature is the lining of the piston-head and explosion chamber with a non-conducting material which is claimed to do away with the use of a water jacket.

The flywheel is constructed as a dynamo, which by rotary motion charges a storage battery, carried in the vehicle. At the time of starting the carriage, the motorman turns a switch which discharges the storage battery through the dynamo, converting it for a few seconds into a motor, which, being upon the main crank shaft, gives rotation and does away with the necessity of of starting the flywheel by hand. After the motor gives the crank shaft a few turns, the cylinders take up their work, and the battery is disconnected from the dynamo which then acts as flywheel.

The crank shaft has a small rawhide bevel pinion engaging a bevel gear on the counter-shaft; atttached to this bevel gear is a friction clutch of new design, which when thrown in and out of engagement with the bevel gear allows the gear to run idly on the counter-shaft.

On the counter-shaft are four rawhide spur gears arranged for speeds of four, eight and fifteen miles per hour forward movement, and four miles per hour backward movement.

These gears are thrown in and out of engagement by a steel feather or key moving inside of the counter-shaft, projecting outside its diameter, and engaging the metal bushings of the rawhide gears.

This traveling key is operated by a lever, and one-half turn of the lever in front gives easy control of the movement of the carriage, from slow speed to high or backing speed.

The spurs on the counter-shaft engage the rawhide spur gears on the rear axle, thus driving the axle. A brake-drum is also placed on the rear axle, and a band friction brake is operated by levers placed under the motorman's foot, giving great leverage and friction surface. This does away with braking the rubber tires.

The rear end of the frame is attached to the rear axle by a journal of novel construction, which contains roller bearings for the rear axle as well as ball bearings for side thrust. The journal also acts as a seat for the springs of the carriage. Outside of the journals, and attached to the hub of the wheels, are the Stewart's Automatic Clutches for allowing one wheel to run ahead of the other in rounding corners.

Attached to the frame in the rear of the cylinders is an exhaust muffler of a cubical capacity of twice the combined capacity of the cylinders, and the exhaust, after passing through the muffler, of special interior construction, is passed into the tubular frame and thence into the atmosphere.

The crank shaft forward of the cylinders has an eccentric device for operating the exhaust valves at proper intervals, and attached to the crank shaft is a device for changing the point of ignition of the spark in the combustion chamber, perfectly controlling the point of ignition, acting as a "lead" and allowing the motors to be operated at variable speed, according to work done.

An important device is the attachment of the front axle to the forward part of the frame, which allows the wheels to rise and fall in a vertical plane, for uneven roads. A king bolt projects outward from the centre of the front frame, and upon this as a centre the axle revolves. The king bolt has a cushion of hard rubber surrounding it, acting as a compensating medium for shocks of uneven pavement and bad roads.

The front wheels are pivoted in forks at the ends of the axle, and levers run from each hub to the centre of king-bolt, through which is operated the steering lever at the point of no motion in the axle.

The steering lever in the hand of the motorman is relieved from any shock from the wheels—so objectionable in many motor carriages when going over uneven roads. The supports on the front frame for the steering device also act as seats for the front springs and as a surface for the "rubbing" contact of the front axle as it rises and falls on uneven roads.

The main shaft bearings, five in number, are kept in perfect alignment by a longitudinal support running through and under the centre of the frame, thereby preventing any "buckling" from torsional or racking strains, caused by high speeds on uneven roads.

The lateral strains upon the tubular frame are taken up by tension rods, running through the tubular frame and fastened to the outside.

The motors and frame, including all gearings, will weigh not over 50 pounds per horse-power.

A motor carriage of this description is entered for the *Cosmopolitan* race on Decoration Day next. It will be of handsome design, have wooden wheels 35 inches and 45 inches in diameter, with hard rubber tires. It will carry a supply of gasolene sufficient for a run of 100 miles.

The flywheel dynamo furnishes the current for the induction coil of the sparking mechanism as well as for the electric lamps at night, thus doing away with the necessity of going to an electric charging station.

One most important feature of the system is the arrangement of all machinery on the truck, independent of the body of the carriage, so that present delivery wagon and express wagon bodies can be used on this truck, and bodies for pleasure and business purposes can be operated on the same truck, being interchangeable.

For the use of persons employing 10 or less horse-power at different intervals, this system is especially advantageous. The wheels can be "jacked up" from the ground and the carriage motor can be belted from the rear axle to any line shafting, and be operated to run water pumps, ventilating fans, threshing machines, etc., or run a dynamo of 10 horse-power, sufficient for 100 incandescent lights or 10 arc lights. In fact, it can be used for any purpose requiring 10 horse-power or less.

All of the parts are being manufactured with the purpose of reliability of work and freedom from repairs.

The long distance—6 feet 3 inches between the wheels—gives an easy motion for high speed, and the broad guage of 5 feet gives stability.

The American Carriage Motor Company is now being organized by prominent carriage and business men of New York City, the present headquarters being at 414 East One Hundred and Twenty-fifth Street.

Badly Needed in India.

We publish the following very interesting letter from one of our subscribers in Bombay, India, a resident American merchant, who wishes to introduce American motor vehicles into that far-off land. Full specifications as to the nature of the vehicles required, direct from the executive officers of the various city departments of Bombay, may be obtained by personal interview with the editor of The Horseless Age.

Bombay, India, Feb. 19, 1896.

Editor Horseless Age.

Dear Sir:—I was greatly pleased to receive by last mail a specimen copy of the initial number of your journal.

It is only your due for me to say that your publication is very neatly gotten up in every respect. It reflects a great credit upon the persons responsible for its issue and the industry to which it is devoted; and while thanking you for your kind remembrance, I heartily wish your novel—though timely—venture the great success it so richly deserves.

For some time I have interested myself on the subject of horseless locomotion, with a view to the introduction of motor vehicles in this country, and it is safe to predict a grand future for the motor vehicle that will supersede bullock or horse-power in the various haulage operations of Indian municipalities, not to speak of its almost general adoption by other corporate bodies, Rajas and private individuals.

I might mention that the supply of bullocks for city work is becoming limited, and high prices are now ruling for decent animals. The Bombay Municipality annually expend over 100,000 rupees in purchasing these animals, and they find it difficult to replace those beasts that have rendered unfit for use by reason of long hours, very hard work, poor food and cruel treatment by their low caste drivers and attendants.

I can assure you that the Bombay Municipality bullock, after a few months' work, is a very sorry looking object and does not last long in city service. From what I have learned other large incorporated cities and also towns are handicapped in a like manner, and their street watering, sanitary and conservancy work is, is to a very great extent, hampered by reason of their having nearly 40 per cent. of draught animals always on the sick list, which necessitates over working the remainder of their available stock. So you can readily understand that there exists a felt want here for some improved system of mechanical locomotion that will effectually, efficiently and economically displace the present mode of carrying out municipal and public works operations.

What is badly wanted is a perfect type of motor vehicle, which is of simple design, and can be operated by untrained labor. It must be strong in all parts and cheaper in working than animal power.

A Benz motor carriage was recently imported into Bombay by M. J. Pack, and excited much favorable comment from the European residents, but created consternation among the natives when it was exhibited on the streets.

The importers, in order to clear their benzene through the Custom House, had to obtain special sanction from Government, as benzene is classed as extra hazardous and dangerous petroleum, and allowed to be only imported in small quantities. There is a very heavy duty on this and naphtha, and its importation is not desired by Government.

So you can see that a large sale out here of benzene motor vehicles is prohibited by reason of the difficulty of obtaining and the high cost of gas making fluids necessary for its propulsion.

The Indian princes are among the foremost purchasers of motor carriages and launches. A motor carriage is already well-known at Kapurthalla, and quite recently the Gaekwar, a prince of mystorious and awful importance to Americans who do not understand the Hindoo tongue, purchased two launches made of aluminum and propelled by petroleum motors.

The post office of Ceylon has ordered a motor wagon for mail service.

Mr. Sanderson, the elephant catcher, is said to be the pioneer in the use of motor carriages in India. He imported some time since a Serpollet boiler and small steam engine, which he used with much success on his hunts.

At Bombay the Municipality is giving serious consideration to the motor problem. Four immense tanks for the storage of kerosene oil have been constructed near the city, and the *Times of India* suggests that now is the time for the Councillors to take up the petroleum motor and carry it to a successful application. It is probable that prizes may be offered for motor vehicles adapted to the city's needs, viz., for the propulsion of fire engines, garbage carts and stages. The chief engineer of the city takes leave of absence next May, when he will visit England, and make a report on the practicability of the present European motors for the work of the Municipality.

There are some parties here arranging to start a limited liability company for the purpose of purchasing from a French maker a number of kerosene motors to compete with the public hack carriages.

There could be a good thing done in building American motor vehicles to do away with the public hack carriages in Indian cities.

The present style of conveyance is of Victoria form, drawn by one horse, and carries four passengers. It is heavy and lumbering, a regular horse killer, and far from being satisfactory. I would like particulars *re* carriages that will carry two, four or six passengers, including the driver, for whom a convenient seat must be arranged either in front or at back of vehicle.

These wagons must be of strong construction to endure great extremes of temperature.

There are eight dry and four wet months per annum in India, and the wood or whatever materials the carriage is built of must be of first class quality, or the affair will tumble to pieces in a short time.

The expense of maintaining and running the present Victoria is, roughly speaking about $2 a day. They are the cause of many complaints from patrons, and a change to a better form of conveyance is earnestly desired.

In this regard it will handsomely repay inventors for their close attention to the subject of replacing these antiquated methods of locomotion with up to date motor carriages, and I should be glad to receive from some of your American constructors complete information as to the best styles of motor vehicles, together with detail drawings, photos and fullest particulars as to working, prices and terms of business.

If I can secure the rights for India of a really good motor vehicle, I am sure I can dispose of a large number of them in a short time, as they are badly needed in every section of the country. I wish to be first in the field with a motor carriage to submit to the Bombay municipality before their engineer returns from England. D. W. Houghton.

5 Apollo Street.

The Gordon Steel Cell Motor Battery.

The present activity in the line of motor development has caused a lively demand for a battery which is in all respects suitable to the hard service required. For motor service an electric battery must have all the qualities of a closed circuit cell, that is, a cell physically able to discharge a constant current at a satisfactory electromotive force, and without polarization. Motor service is especially hard upon any form of battery, because in magnetizing the usual sparking or induction coil the circuit is broken and closed every second at least, which is even harder service than where a constant current is required. To sucessfully perform such work a cell must be without polarization, and this is true only of a closed circuit battery.

To be adapted to motor use the cell should be unbreakable, strong, clean, long-lived, efficient, non-freezing, and economic. All of these qualities are claimed for the Gordon Steel Cell Motor Battery, a special form of the well-known Gordon cell, which has been placed upon the market to meet the requirements of the motor and gas-engine trade.

The steel cell is much lighter and stronger than the glass cell, and the total weight of the cell is less than that of any other cell suitable for this service. As only three or four cells are needed for the average vehicle or boat motor the economy of space and weight will at once be seen.

The manufacturers state that it can be demonstrated that size and weight of elements considered, the output of useful energy from this cell is much greater than from any storage battery known, and it is not susceptible to injury from vibration or shock, which in many cases will completely discharge a storage cell. Another advantage, as compared with a storage battery, is that it does not require constant recharging, which is frequently inconvenient and expensive.

The Gordon Steel Cell Motor Battery is manufactured in two sizes—No. 1, 6 x 8 inches, and No. 2, 4½ x 6 inches—by the Gordon-Burnham Battery Co., 84 West Broadway, New York, whose advertisement appears on another page.

Many of the leading gas engine and motor manufacturers are now using this battery exclusively, and recommend it in the highest terms.

Regulations Regarding the Use of Vehicles in New York City.

Inquiries at Police Headquarters and at the office of the Park Board to ascertain the regulations now in force covering the use of vehicles in New York City, have elicited the following information:

The section of the police laws relating to the speed of vehicles is subjoined:

Chapter 25, Section 1,932. Any person who shall drive any horse through any street, lane, alley or public place within the City of New York, with greater speed than at the rate of five miles in an hour, shall be deemed guilty of disorderly conduct, and upon conviction thereof by any magistrate, either upon the confession of the party or competent testimony, may be fined for such offense any sum not exceeding $10; and, in default of payment of such fine, may be committed to a prison by such magistrate until the same is paid; but such imprisonment shall not exceed ten days.

The ordinances of the Park Board limit the speed of vehicles on the drives to seven miles an hour.

Four-in-hands of private owners are permitted to use the drives with either carriages or sleighs, but more than four horses are not allowed without special permit.

No regulations have as yet been made with reference to motor carriages, or any vehicle propelled by other than animal power.

Canal-Boats with Motors.

It was announced on the New York Produce Exchange recently that the American Sugar Refining Company had entered into a contract with the new Steel Canal Boat Company by the terms of which the sugar company is to furnish all the West bound cargoes for the fleet of 15 new steel canal boats which are to begin running between New York and Cleveland on May 1. These boats will probably be propelled by a petroleum motor with which the company has been experimenting.

It is said it has been found that one gallon of oil will propel a motor boat and three consorts for one mile in still water.

Work of the Motor Car Club.

Frederick R. Simms, vice-president of the Motor Car Club, of London, writes that the most cordial relations have been established between the Motor Car Club and the Automobile Clubs of France and Belgium. Similar negotiations are pending with the American Motor League. The editor of The Horseless Age has received from Mr. Simms a number of copies of the prospectus of the International Exhibition of Motors and Motor Vehicles, to be held at London this Spring and Summer, which will be sent to subscribers on application.

...JOIN...
THE
American
Motor League

COMMUNICATIONS.

An Open Letter to Mr. John Brisben Walker, Editor of the "Cosmopolitan."

Charles B. King, treasurer of the American Motor League, recently addressed the following letter to the editor of the *Cosmopolitan Magazine*:

DETROIT, MICH., March 23, 1896.

JOHN BRISBEN WALKER, Esq.,
Editor *Cosmopolitan Magazine*,
Irvington, N. Y.

Dear Sir:—On behalf of the motor vehicle movement and those that are interested in the development of this new art it is earnestly hoped that the *Cosmopolitan Magazine* will increase the amount of prizes offered to a sum of not less than $5,000.

This art is at present in a crude state, and is mainly in the hands of the inventor, who has not as yet been encouraged by capital.

A motor vehicle cannot be built at present for a sum much less than one thousand dollars ($1,000), and adding to this transportation and personal expenses, it is plainly evident that the *Cosmopolitan* contest cannot be to a great extent otherwise than a local affair. The comparatively small number of contestants brought to the line would, in a measure, be a disappointment to the public, who would not understand that the country at large was not represented.

The writer, being brought into intimate contact with inventors and persons interested in this new industry, has had ample opportunity to learn the expressions of these people. C. E. Duryea, president of the American Motor League, and its members, as well as all others interested, coincide with the views as expressed here.

This letter is respectfully submitted to those who have the contest in charge, and it is earnestly hoped that the suggestions made here will be duly considered. Yours truly,

(Signed) CHARLES B. KING,
Treasurer American Motor League.

Thinks Speed the Only Requirement in a Race.

SPRINGFIELD, MASS., March 21, 1896.

Editor Horseless Age.

DEAR SIR:—Among the conflicting opinions as to what should *count* in a motor wagon race, I will add another.

Speed is the principal thing that the great public will look at. Conceive that the last of a dozen carriages arriving at the winning post is awarded the first prize because it won on other points; the decision would be derided and the whole competition be adjudged a fake. To be sure, the speediest carriage would probably make enough other points to justify a first prize.

Judges are asked by different ones to decide and give points on:

Safety.
Comfort.
Manageability.
Simplicity.
Range of utility.
Cost of operation.
Cost of Maintenance.
Initial cost.
Durability.
Appearance.
Cleanliness.
Odor.
Vibration.
Noise.
Speed.

An array of questions only to be answered by tests extended over a considerable space of time.

My idea of a motor wagon race is that speed should be the only requirement. That the course should be over fairly good country roads.

That three runs should be made and the best two to govern.

This latter will eliminate, to a degree, the effect of a small accident which may be due to bad shop work or inattention, and not to an inherent defect.

With three trials of 50 to 75 miles each, the objection to a short race would be lessened.

As to the *Cosmopolitan* race, the city end is objectionable. With a necessity of making speed, whatever may be the points assigned to it, there is danger to the contestants as well as to others. Then should a carriage balk in the crowded streets, a jam might occur difficult to get out of. The progress through the city will probably degenerate into a parade, even if the police do not so order. GEORGE HENRY HEWITT.
Pres. Duryea Motor Wagon Company.

Another Judicial Code.

DECATUR, Ill., March 21, 1896.

Editor Horseless Age.

DEAR SIR:—Some time ago we received an inquiry for our opinion on the conduct of a motor carriage race, and thinking perhaps it would interest your readers, we send the same as follows:

We think it advisable to make a maximum speed, say 12 miles per hour, those making a faster average speed being considered the same. This would be quite fast enough, as what we want is a practical carriage, one for general use, not for racing; one that will go at a good speed, have a strong pull at that speed, and be able to continue the same speed throughout, taking into consideration the kind of roads. Then economy of operation is the next factor to consider, because the better the economy the more practical the motor, and, besides, it would be a very easy matter to construct a powerful motor when the economy of fuel was left out of consideration. Simplicity and compactness should be considered together, as the motor might be compact, but be so intricate that in order to repair a certain part it would necessitate much unnecessary work to arrive at the fractured part, which might be the same with adjustment.

Then, again, a motor might be simple in all of its parts, but not compact. It would occupy too much consideration to mention in detail all concerning the different subjects to consider, but those mentioned we consider first, besides there being vibration, odor, ease of guiding, controlling of speed, variation, quick stopping, etc. Why not make awards on the following principle: Say you call speed 40 points, economy 20 points, etc., making the total number of points that each motor vehicle can receive 100 points. Now, say Mr. A. comes in first, you give him 40 points in speed, you award him second in economy, which we will call 15 points, and then 5 points in simplicity and compactness, 2 points in elegance of design, 2 points in guiding, 2 points in controlling of speed, and perhaps nothing in remaining features. Now, Mr B. comes in second, and you give him 35 points in speed, economy 20, simplicity 10, elegance of design 5, guiding 5, quick stop and start 4, vibration 3, odor 3, the total of which is 85 points, whereas Mr. A.'s total was 66 points, which would allow Mr. B. first prize for the most practical carriage.

Hoping this will be of some interest to your readers, we remain,
Yours very truly,
H. MUELLER MFG. CO.

A Suggestion for Mr. Walker.

Editor Horseless Age:
SAN FRANCISCO, CAL., March 20, 1896.

DEAR SIR:—The idea of a speed contest for motorigs taking place on Broadway hardly stands the test of mature consideration. The danger to life and limb is certainly great and the frequent slacking of speed and stoppages that must undoubtedly occur in order to avoid collisions makes the speed of that part of the run which is along Broadway more a matter of luck than of having the best rig or in managing it in the most skilful manner.

The following outline of a modified plan is offered for consideration. If Mr. Walker would consent to the substituting of it for the one already announced it would, with but little doubt, meet with the approval of the manufacturers and all interested, and the public would have a much better opportunity of seeing the procession satisfactorily and of enjoying the sight.

Require all contesting vehicles and the umpires to be at the *Cosmopolitan* office at the hour named, which should be early in the day. Shut out any who may not be on time At the hour named, start them on a parade up Broadway at a moderate rate of speed. The umpires should be in their respective places. The rigs should be started 50 yards apart, and the umpires be instructed to keep that distance between them as nearly as practicable.

A comfortable time only should be allowed for the procession to reach the appointed place in Central Park, where the speed contest is to begin. At the hour set the signal should be given as promptly, and the vehicles get off as promptly, as Gen. Sherman's army did at the review in Washington after his march to the sea.

If this were done, it would be a satisfaction to have the course measured from start to finish, which should be some distance above Irvington, and flags planted at the same. Fifty miles from the starting place, making a run of 100 miles would not be too long. As soon as the time is set for the parade to start down Broadway it should be telephoned ahead and placards be posted at different places announcing the hour.

A certain set time, half an hour or an hour, after the arrival back at the starting place of the first of the contestants, all the rigs in should start on a parade again down Broadway in the order of their arrival back at the goal, the winners flying their blue, red and yellow flags, again keeping 50 yards apart, so that the people would have a good opportunity to observe carefully each individual vehicle. Any stragglers arriving at the goal after the procession had started, should be instructed to continue down to the office of the *Cosmopolitan* before being dismissed.

It might be better not to stretch the course out over too great a length of road, and in order to avoid this, and to make a very nice feature as well, make a coil of 10 or 15 miles in the course on that part of the road taking in Irvington. It could be at the extreme end of the route, or not so far up. This would enable people to station themselves in the coil and obtain four views of the race, and if the exact distance between the flags at the turning point was announced, it would enable them to time the rigs as they passed each way, which would add greatly to the interest. A. L. BANCROFT.

An Echo of the Chicago Race.

Editor Horseless Age. MARCH 21, 1896.

DEAR SIR:—It seems to be the general impression that our carriage is strictly a Benz carriage. Therefore, for the benefit of others and due credit to ourselves we wish to make a statement to the effect that H. Mueller imported a Benz motor carriage about April, 1895. We had full instructions for operating the carriage and used every advantage in our power, but were unable to make it give satisfaction. It often stopped without the slightest cause, its speed was limited to about 10 miles per hour at best, and it mounted slight grades with difficulty.

As we had a well-equipped machine shop at our disposal we commenced to experiment and to improve the carriage, and had it prepared in time to take its chances with all others in the Chicago *Times-Herald* race of Nov. 2, 1895. By previous reports it will be seen to have covered a distance of 92 miles in eight hours and forty-four minutes. It seems impossible that the few alterations made should make such a remarkable change in the power and working of the motor, considering the distance covered and that only five and one-half pounds of gasolene were used during the entire trip.

After this race almost the entire construction of the motor was changed, retaining the same cylinder and valves, but operating them differently. When this carriage was again taken to Chicago for the second *Times-Herald* race it was called the Benz-Mueller Motor Carriage; giving Benz the credit of the generator. If we had had time before this race we could have built a new carriage, with a few exceptions like it, without any infringements on the Benz motor.

In connection with this we wish to say that as far as we can learn about the building of motors in general there is not a builder at the present day working entirely upon his own ideas, and, therefore, we expect as much credit for our motor as if it had been strictly an American motor carriage.

In the second race we were allowed the prize of $1,500, the first prize being $2,000 and a gold medal. According to this it seems as if there was no first prize as the carriages coming in first received but the $2,000, and did not receive the gold medal, for reasons best known to the judges. Therefore, having won the first race, and second prize in the second race, we claim the honor of winning the first motor carriage race in the United States of America.

Yours very truly,
H. MUELLER M'F'G CO.

A Chinese journal bewails the prospective introduction of motor vehicles into the land of tea, on the ground that porters, a very numerous class there, would lose their jobs.

A French Motor Wagonette.

The Compagnie Génerale des Automobiles, of Paris, is manufacturing a type of motor vehicle termed a wagonette, seating six persons and much admired in France for its pleasing appearance.

The petroleum motor is of the four-cycle form, placed horizontally in the wagon, and develops five horse-power. The entire regulation of the motor is managed from the seat, and all the machinery is protected from dust and concealed from view in the body of the wagon without any change in the form of the latter.

Power is transmitted by means of belts which give it a very even pull, and render repairs *en route* easy. Chains carry the power from the shaft to the wheels; steering is accomplished by a wheel controlling two rods.

Starting and stopping are instantaneous, and speed is regulated by means of the inlet valve.

There are two brakes, a lever and a foot brake, the latter very powerful.

As the vehicle is abundantly supplied with springs of the first quality riding is very easy.

In stormy weather the vehicle can be changed to a closed wagon, which renders it particularly suitable for family use.

◆ ◆ ◆

The Dietz Ball Bearing.

The H. J. Dietz Co., Ltd., Postal Telegraph Building, New York, are the manufacturers of a new ball bearing, which is particularly recommended for motor vehicles.

In this bearing the balls, instead of running in cups and cones, revolve directly on the axle and inside of the hub.

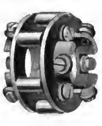


FIG I.

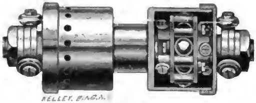


FIG 2

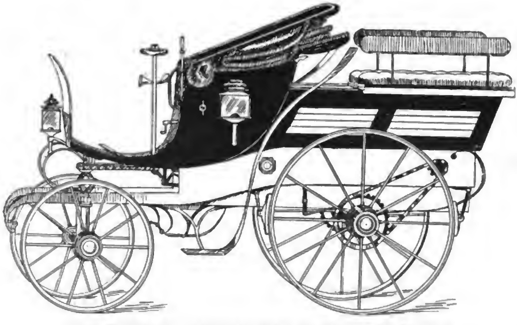
The balls are separated by means of a loose double ring (Fig. 1.), with cylinders axled therein separating the balls. The cylinders are mere idlers, carrying no weight.

When a ball carrying weight revolves to the right, and comes in contact with a cylinder, it causes the cylinder to move in the opposite direction, and the cylinder, by revolving, aids the next ball to move in the required direction.

The loose double ring also moves at the command of the ball, reducing friction to a minimum.

In consequence of this novel construction, the manufacturers claim it is the only ball bearing fitted to carry a heavy load.

Fig. 2 shows the hub with bearing in position.



MOTOR WAGONETTE. COMPAGNIE GENERALE DES AUTOMOBILES, PARIS.

The Bordman Motor Cycle.

Up to the present time all the motor cycles described in The Horseless Age have been of the piston variety, but the design we now present is on the turbine or rotary principle, and in form and lightness is certainly commendable.

The motor, which is about eight inches in diameter, occupies the position of the ordinary treadle. It is intended to run at high speed, but may be reduced to any required speed by light concealed gearing on the hind axle.

While the inventor is not prepared to give full details of the construction of his motor, he states that it is not a compression motor, but takes the air at ordinary pressure and explodes it by means of an electric spark. He uses very little gasolene and expands it thoroughly, claiming under his system to get rid of vibration and noise, and generate much less heat.

The gasolene tank will contain a supply sufficient for a journey of over 50 miles.

A single cell battery, weighing three pounds, generates the spark.

The flow of gasolene is controlled by a valve on the top frame, and just behind this valve is the contact breaker.

The battery and spark coil are concealed in an ordinary pocket in the front angle of the frame.

The brake is applied to the rear axle by means of a lever close to the rider's hand.

The weight of the entire apparatus is said to be less than 10 pounds, and as the motor has no internal rolling parts no internal lubrication is necessary.

The inventor of this motor is John J. Bordman, 144 Henry Street, Brooklyn, N. Y., who was recently granted patents on it. He states, however, that he is making improvements on his original idea, and has applied for patents on these later features also. He promises full details for a future issue.

It is his intention to apply this motor to all purposes where light power is required.

◆

Mishel's Attachment for Motor Vehicles.

P. Mishel, Gloversville, N. Y., has applied for a patent on an attachment for motor vehicles, which he describes as applicable to any vehicle, including a bicycle, and can be used with any motor, gasolene, kerosene or electric.

One of these attachments was recently put onto a delivery wagon belonging to Martin & Naylor, a dry goods house of Gloversville. The wagon weighed about 800 pounds, but is said to have been run on smooth pavement by foot-power with perfect ease.

Speed can be regulated from 2 miles up to 30, if the motor has sufficient power, and the cost of manufacturing the attachment is said to be very low, not exceeding $50 for an ordinary light rig.

The inventor's chief claim is that his attachment can be placed on any ordinary wagon at slight expense.

In the accompanying drawing

1 is the hind axle of the wagon.
2 is the front block of the spring.
3 is two bars of iron which are attached to Nos. 1 and 2.
4 is a long shaft attached to 3 and a little shaft in front attached to 3.
5 is the sprocket wheels.
6 is the transmitting chains.
7 is the motor which is put on 3 and attached with 6.
8 is a clutch to loosen the sprocket wheel of the long shaft when the wagon is turned.
9 is the steering device.

No. 5, the sprocket wheel on the hind axle, is put on the hind wheels of the wagon.

All the attachments can be put on the wagon without injury to the body.

◆

The Olds Vapor Boat Motors.

P. F. Olds & Son, Lansing, Mich., have just brought out a vapor boat motor which is entirely self-contained, all tanks in boat or underneath the seats or floor, as well as all connections being dispensed with.

Enough gasolene for a day's run is stored in the iron walls of the motor and can be removed only as consumed.

Another advantage claimed for this motor is the ease of setting the outfit in the boat, as there are no metal pipe connections to make and the motor need not be placed in line with the shaft, the manufacturers preferring that it should set level instead of tipped up on end to line with wheel shaft.

To avoid the necessity of lining with the wheel shaft a universal friction reverse clutch and coupling is furnished, so that all that is required is to place the motor in the most convenient position, connect on a rubber hose or tube to the cooling pump (the overflow being through the exhaust), and a rubber hose for the exhaust, which is passed through and under the seat or floor and out through the stern.

The surplus cooling water passes off with the exhaust, protecting the hose from the heat of the exhaust, and forming a perfect muffler.

The working parts throw off no oil, and are plainly in view hence easily adjusted when necessary.

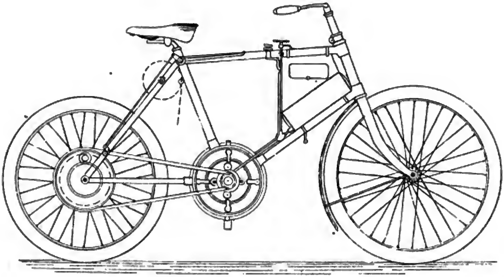
The reverse, which is shown in cut, is very simple and very positive in its action.

The speed of the motor is controlled by a lever, shown at top of the cylinder.

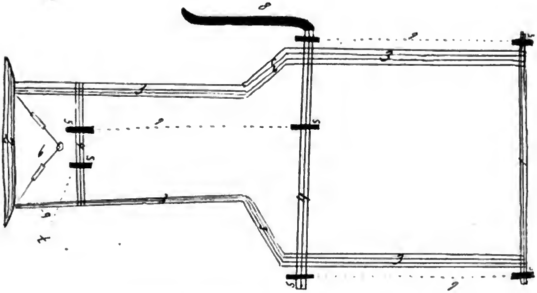
Sizes from two horse-power to eight horse-power are manufactured; the weights varying from 250 to 900 pounds.

◆

MOTOR CARRIAGE. H. MUELLER MANUFACTURING CO., DECATUR, ILL.



MOTOR CYCLE. JOHN J. BORDMAN, BROOKLYN, N. Y.



ATTACHMENT FOR MOTOR VEHICLES. P. MISHEL, GLOVERSVILLE, N. Y.

Getting Returns Every Day.

DERBY, Conn., March 20, 1896.

Mr. E. P. Ingersoll.

DEAR SIR:—In reply to yours of the 19th inst., we would say that we are getting returns every day from our ad. in THE HORSELESS AGE.

Yours very truly,
HOUSATONIC SKIFF & CANOE CO.,
J. A. Howe, General Manager.

The Arrow "Locomotor."

The illustration shows a motor phaeton accommodating two persons, built by Adolph Moesch & Co., 384 Broadway, Buffalo, N. Y. Power is furnished by a double-acting 3½ horsepower gasolene motor of their own design. The speed is from four to fifteen miles an hour, forward as well as backward, on an average road, and is managed by a lever at the seat.

This lever also regulates the speed and power of the motor. The power is transmitted by means of belts and sprocket chains.

The vehicle carries sufficient water and gasolene for a day's run.

The steering apparatus is patented and is claimed to be unexcelled.

The brake is worked by a foot lever in the ordinary way.

Ball bearings are not used, but the makers are prepared to put them in if desired. Solid rubber tires are fitted on the wheels, and the whole construction is very strong, so as to be adapted to our rough country roads.

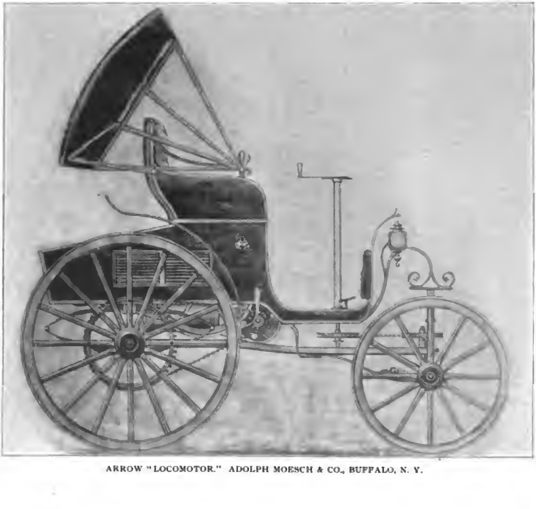
E. F. Hirst's Design for Motor Wagon.

E. F. Hirst, of Richmond, Ind., submits the accompanying design for a motor wagon, with the remark that "while there is nothing especially new about it, it seems to simplify the thing a little, and perhaps some one might get an idea from it to use in some other form." The hind wheels are 5 feet 8 inches. The sprocket is fast in the wheel, and the wheel is loose on the axle.

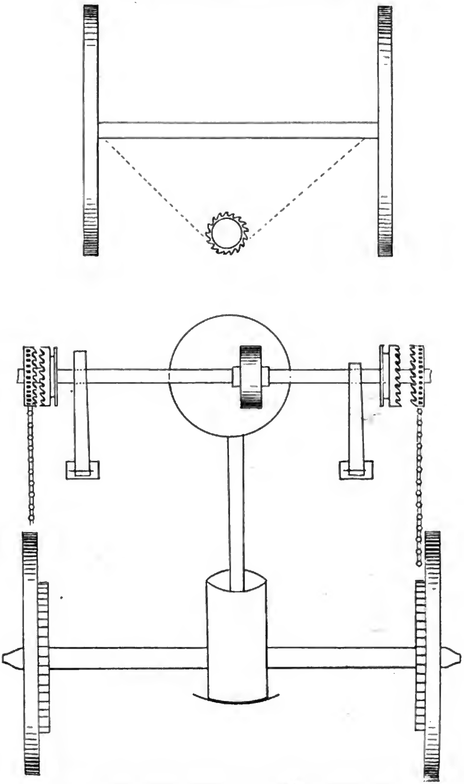
The lever for shifting the pulley also brings it in contact with the disc by downward pressure. The sprocket is loose when disconnected from the clutch.

The front wheels have a 3-foot width of track, to travel in the horse path of an ordinary two horse vehicle.

The clutches on each side are kept in place by springs, except when they are thrown out of gear by the same lever that steers the front wheels, which unlocks the wheel on the inside of the circle in turning corners.



ARROW "LOCOMOTOR." ADOLPH MOESCH & CO., BUFFALO, N. Y.



GEARING FOR MOTOR WAGON. E. F. HIRST, RICHMOND, IND.

TRADE NOTES.

Binghamton, N. Y., is to have a motor carriage company.

The American Carriage Motor Co., New York, will enter a carriage in the *Cosmopolitan* race.

Wallace Grant, of Brooklyn, N. Y., and the American Carriage Motor Company, New York, have entered in the *Cosmopolitan* road contest.

William W. St. John, of Binghamton, N. Y., has invented a a very light steam engine which he believes available for the propulsion of wagons.

F. M. Collins, Sulphur Springs, Col., who runs a stage line 50 miles long through the Rocky Mountains, is thinking of introducing motor stages.

The Duryea Motor Wagon Company have lately received inquiries from India, East and West Indies, Australia and several South American countries.

Hans Renold, of Manchester, Eng., the world-famous manufacturer of drive chains, has recently patented a chain named the "Silent," which he thinks particularly adapted for motor vehicles.

The New Power Company, owners of the patents on the carbonic acid motor, have designed a pleasure carriage to be propelled by a carbonic acid motor, and will probably enter it in the *Cosmopolitan* road contest.

E Roger, builder of the Roger petroleum motor carriages and one of the prize winners at the Paris-Bordeaux-Paris race, is one of the organizers of the Société des Fiacres Automobiles, which is to introduce motor cabs throughout Paris.

W. J. Smith, of New Haven, Conn., inventor of the highly ingenious geometric drill, is building a 75 horse-power vapor motor for a large boat. The motor is on the rotary principle, and is said to exhibit some very novel and ingenious features.

C. H. Barrows, Willimantic, Conn., is organizing a stock company to build his three-wheeled motor vehicle, and has completed an experimental machine which will be illustrated and fully described in the next issue of THE HORSELESS AGE.

The Duryea Motor Wagon Company have taken steps to supply the active demand for their wagons, and about the 1st of May they will take one of their vehicles to London for the purpose of organizing a company there to manufacture under their patents.

The Housatonic Skiff & Canoe Company, Derby, Conn., have issued their annual catalogue, which contains a supplement on motor boats. They have a special design for this purpose, and are prepared to furnish any motor their customers may desire.

John Jacob Astor has secured a three years' lease of the brick building at 124th Street and East River, New York, which formed a part of the plant of the the Steers Lumber Co. It is said that the building will be used by the Keely Motor Co. in perfecting the new motor on which Mr. Keely recently applied for patents.

The Daimler Motor Co. find their launch business outgrowing their recently enlarged quarters, and are accordingly fitting up a new building down by the water's edge about a quarter of a mile distant, which they will devote exclusively to the manufacture of launches. Communication with the main factory will be kept up by Daimler wagons.

L. J. Wing & Co., 109 Liberty Street, New York, are the sole manufacturers of the Stewart automatic clutch, which is specially designed for motor vehicles, enabling the driving wheels to turn independently in rounding corners. It is claimed to be the simplest and most reliable device yet invented for this purpose, taking the place of the complicated and heavy equalizing gears hitherto employed.

C. E. Duryea, joint inventor with his brother of the Duryea motor wagon, is organizing a company at Peoria, Ill., to build motor launches and motor carettes for public transportation of passengers. These carettes, which are sure to come into extensive use, will seat 10 or 12 people, and will be propelled by Duryea motors of large power. The launches will also have Duryea metors of special construction.

The American Motor Co., Havemeyer Building, New York, have secured the services of competent draughtsmen and mechanics, and are now prepared to work out for inventors any ideas they may have in the application of motors to vehicles. The "Portable Boat Motor," illustrated in the last issue of THE HORSELESS AGE, has been so well received that they find an immediate increase in facilities necessary.

The H. Mueller Manufacturing Company, Decatur, Ill., are now making a strictly American motor carriage, which will carry four persons, both seats facing forward, and will have a double cylinder motor. These cylinders can be used together or separately, and the steering apparatus will exhibit some new features. The wheels will be fitted with pneumatic tires. If they can get the carriage built in time they will enter the *Cosmopolitan* race.

The Rubber Tire Wheel Co., Springfield, O., have opened a branch office at New Haven, Conn., making eight branches in all which they are now maintaining. They have prepared a very handsome calendar, which they are sending out to the number of about 200,000. With more than 9,000 sets of their tires now in use, and hardly a complaint, they feel warranted in stating that they have the only successful rubber vehicle tire yet made in this country especially for motor carriages.

SPECIAL NOTICES.

—o—

Advertisements inserted under this heading at $2.00 an inch for each issue, payable in advance.

WANTED.—To buy or rent a Horseless Passenger Conveyance to seat eight persons, capable of a speed of ten miles per hour on a level street. Steepest grade about ten per cent. Correspondence solicited giving full particulars, cuts, terms, and guarantee. BELCHER WATER BATH CO., Main and O'Fallon Sts., St. Louis, Mo.

FOR SALE CHEAP.—A HORSELESS VEHICLE GEAR.

The entire running gear, with new improved steering gear and new propelling construction, ready for the attachment of any motive power. A good opportunity for some inventive genius to complete the whole at a comparatively small expense. Call or address

JOS. H. LIPPE, 49 and 51 Marion St., New York.

Join The American Motor League.

.... 189

American Motor League,
335 Dearborn Street, Chicago

I hereby make application for membership in **The American Motor League**, and I agree to comply with the Constitution, By-Laws and Rules. I enclose Two Dollars for initiation fee and One Dollar for annual dues.

Name..

Street..

Town.................................... *State*..................

Cut this out and send it to the Secretary, Dr. J. Allen Hornsby, 335 Dearborn Street, Chicago, Ill.

The Motor League

has a Mission.

JOIN IT.

Crawford Bicycles are unsurpassed

MAKERS:
The Crawford Mfg. Co.
HAGERSTOWN
MD.

Empire Motor Company,

IMPERIAL POWER BUILDING,

P. O. Box 93, Sta. A. PITTSBURGH, PA

Park Traps,
Delivery Wagons, Motocycles,
Package Delivery.

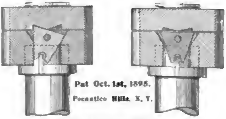
Lightest, Cheapest, Most Economical.

THE STEWART AUTOMATIC CLUTCH,
For Motor Vehicles of all Kinds.

Regulates the drive wheels in turning corners. By attaching a clutch to each drive wheel they turn independently of each other, or clutch can be used on drive shaft, accomplishing the same purpose.

Simplest and Most Reliable Device Yet Invented for the Purpose.

Send for Circular.

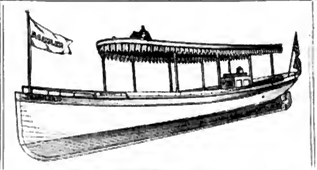


MANUFACTURED BY
L. J. WING & CO.,
109 Liberty Street, - - - NEW YORK.
ALSO MANUFACTURERS OF
WING WORK WAGONS,
and the Wing Gas Motors for Wagons and Launches.

DAIMLER MOTORS.

FOR LAUNCHES.

Triple, Twin, and
Single Screws.
Paddle and
Stern Wheels
of lightest draft.



For Stationary
Purposes,
SUCH AS
Hoisting, Pumping,
Electric Lighting, and
Driving all sorts of
Machinery,
ON LAND OR WATER.

NO LICENSED ENGINEER, PILOT, OR GOVERNMENT INSPECTION REQUIRED.

The Daimler Motor is the most powerful and compact, as well as reliable engine now on the market.

THE DAIMLER MOTOR CARRIAGES

Were awarded the following Prizes:

1. Grand Prize 5,000 Francs, at Paris, July, 1894.
2. Gold Medal and First Prize at Turin, May, 1895.
3. First Prize of 40,000 Francs, as well as the Second, Third, and Fourth Prize, at Paris, June, 1895.

DAIMLER MOTOR CO., - Steinway, Long Island City, N. Y.

THE STEWART AUTOMATIC CLUTCH,

For Motor Vehicles of all Kinds.

Regulates the drive wheels in turning corners. By attaching a clutch to each drive wheel they turn independently of each other, or clutch can be used on drive shaft, accomplishing the same purpose.

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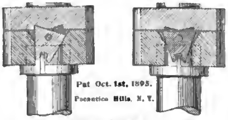

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WING WORK WAGONS,

and the Wing Gas Motors for Wagons and Launches.

Unlimited English Demand for Motor Cars and Motor Cycles.

England Has Not Begun to Manufacture.

American Inventors and Manufacturers of

MOTORS, MOTOR CARS

—AND—

MOTOR CYCLES

Wishing to sell their productions

IN ENGLAND

Or to deal with English Rights
should

Exhibit (free of charge) at International Exhibition, Imperial Institute, London. The Attraction of the London Season.

and

Place (without charge their names and description of productions in Motor Car Club Register of Motors and Motor Cars. 3,000 capitalists and buyers on books.

Apply HON. SECRETARY MOTOR CAR CLUB,
40 Holborn Viaduct, LONDON.

Duryea Motor Wagon Company,

SPRINGFIELD, MASS.

MANUFACTURERS OF

Motor
Wagons,
Motors, and

"1896 MODEL."

Automobile
Vehicles
of all kinds.

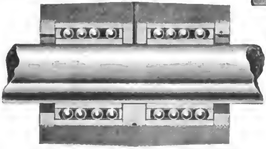
TRADE **THE "HUB"** MARK. **ANTI-FRICTION BALL-BEARINGS**

NO WEAR. NO CARE. NO ADJUSTMENT. NOISELESS. EASILY APPLIED.

For Motor Vehicle and General Machine Construction.

Enormous Saving in Friction and Power Transmission.

No wear on either Shaft or Box. Balls roll only upon hardened steel *removable* surfaces.



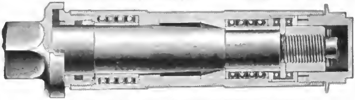
Type B, or DOUBLE RADIAL BEARING.
(For heavy loads and hard service.)

CAUTION:—Infringement of Patents will be vigorously prosecuted.

Descriptive circular with full information mailed free upon receipt of address. Correspondence solicited.

For Light and Heavy Vehicles.

Sizes, ¾, 1, 1⅛, 1¼, 1⅜ and 1½ inches. Larger sizes in process.



Patented Aug. 19, 1890, April 7, 1891, Jan. 5, 1892; and July 11, 1893.

The only Ball-Bearing on the market supporting the following claims

1.—A SUFFICIENT NUMBER OF BALLS to properly carry heavy loads.

2.—SEPARATE SETS OF BALLS to take the load and the "end thrust."

3.—The balls CONFINED IN CAGES, enabling them to be handled as ONE PIECE.

4.—Requiring ABSOLUTELY NO ADJUSTMENT.

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DEVOTED TO MOTOR INTERESTS.

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THE HORSELESS AGE.

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The Road Vehicle and the Track Vehicle.

THE essential difference between the road vehicle and the track vehicle is the track. In the case of the track vehicle the possession of the right of way renders possible the construction of a roadbed suitable for high speed and of vehicles capable of carrying heavy loads, and so far as circumstances will permit, prevents road vehicles from interfering with its progress.

The speed of the street car is limited in cities by the large number of road vehicles which must necessarily share its right of way, but as the track vehicle legally has the preference, its speed is greater than is possible for the road vehicle to attain in crowded streets.

The speed of the railroad train is also limited in cities for the same reason, while in the country districts, where road vehicles are few, the maximum of speed is attained.

As a general principle, the speed of a vehicle depends upon the nature of the roadbed over which it travels, and the number of obstructing vehicles which it encounters on its way. However excellent the roadbed, high speed cannot be allowed where the presence of many vehicles renders it unsafe, and however unobstructed the way, high speed is also dangerous where the road is rough and treacherous.

The motor vehicle is a road vehicle, and must be governed by the same general rules and conditions that now apply to the horse vehicle. Where roads are good and few vehicles are encountered, high speeds will be permitted, but where there are many vehicles to share the common rights of the road, or where the obstructions lie only in the road itself, high speed is not to be thought of.

As these are the general laws governing the speed of both road and track vehicles, the demand for speed which is characteristic of our age can only be satisfied by an improvement of the roads on which the vehicles must travel, and by reducing or entirely eliminating the obstructions in their path. The motor vehicle is undoubtedly capable of greater speed than the horse vehicle, and with its low build will be much safer under rapid headway than the latter, but before any considerable increase in speed is to be gained, roads must be improved and safety and comfort assured. So far as the number of vehicles is concerned, this is constantly on the increase as methods of locomotion improve.

Yet even when roads become ideally smooth and solid the speed of the road vehicle will still be less than that of the track vehicle, for the reasons above mentioned. The special track and the right of way will still favor the track vehicle.

Hence it seems unreasonable to suppose that the motor vehicle will ever compete with the track vehicle in long distance transportation. In local transportation of all kinds it will find its legitimate field, and as facilities for local transportation improve, so will the facilities of long distance transportation improve in direct ratio. One will help the other. Observe the growth of rapid transit in our great cities, where underground and elevated railroads and swift trolley lines are required to carry the people to and fro for business and for pleasure, and this in the era of the bicycle! Where time is to be saved between two given points the track vehicle generally has the preference to-day, and it will continue to have the preference, for time is daily becoming more valuable.

Improvements in track locomotion are in store for us, of which now we do not even dream. Who knows but in the near future we shall be wafted across the continent through pneumatic tubes at the rate of several hundred miles an hour? In that day will the road vehicle, however perfect it may be, compete with the track vehicle for long-distance travel? The assumption is wholly unfounded.

Both the road vehicle and the track vehicle have their place in the modern system of locomotion, and it is not probable that their relation will be materially changed by the introduction of the motor road vehicle.

Mr. Salom on "Automobile Vehicles."

In the April issue of the *Journal of the Franklin Institute*, Pedro G. Salom, of the firm of Morris & Salom, designers of the "Electrobats," which received the gold medal at Chicago last Fall, writes on "Automobile vehicles," with considerable reference to the "Electrobats" of Morris & Salom. In fact, after reading the article, we cannot avoid the supposition that Mr. Salom's definition of automobile vehicle *is* electrobat, and that he is unconscious of the existence of anything else in the motor vehicle line that is worthy of the slightest consideration. In general tone the article partakes more of the character of a business circular than a general scientific treatise, and fairness demands that something should be said on the other side.

We will pass over Mr. Salom's introductory quotations from poetic fiction and his references to the early "road locomotive" era of the motor vehicle, as of limited interest to the practical experimenter of the present day. If Homer knew of any "horseless carriages," they were probably drawn by mules or oxen, and would offer no examples of value to the modern world.

The early efforts of the steam inventors to produce a satisfactory "road locomotive" are scarcely more helpful, because of the false conception of the subject which these early pioneers had, and the crudeness of the whole science of locomotion at that day.

The account of the experiments of Morris & Salom, and their final result in the construction of the "Electrobats," has already appeared in THE HORSELESS AGE, as also the full description of these vehicles which follows.

But when, as a conclusion of his article, Mr. Salom institutes a comparison between the electric and the gasolene vehicle, he catches the Homeric infection again, and gives us as conspicuous an example of prejudice as will be found within the pages of a scientific journal. So closely has he glued his eyes to his own vehicles that the remarkable progress of the past year in the gasolene field has entirely escaped him. The disadvantages of the electric vehicle he has omitted to state, and the advantages of the gasolene vehicle he has as carefully ignored. The full text of this comparison is reprinted.

THE DISTINCTIVE POINTS OF ADVANTAGE POSSESSED BY THE ELECTRICALLY-PROPELLED VEHICLES ARE AS FOLLOWS:

(1) Absolute safety.
(2) No noise.
(3) No vibration.
(4) No heat.
(5) No odor.
(6) Simplicity of construction.
(7) Ease of handling.
(8) Perfect control.
(9) Cleanliness.
(10) Economy of power.
(11) Economy of operation.
(12) Cost.
(13) Elegance of design and freedom from mechanical appearance.

Considering these points in their order—first, as to safety. A vehicle propelled by storage batteries is absolutely free from danger to life or property. Can the same be said of a gasolene vehicle carrying from 8 to 10 gallons of gasolene? Would you be permitted to store such an amount of gasolene in a barn or stable without forfeiting your insurance; and would not the general introduction and handling of such vehicles, by inexperienced persons, result in a loss of life and destruction of property? Can a vehicle using such a fuel be considered to have general utility and adaptability?

Would it be practicable to operate delivery wagons, say of Adams Express Company or any other large corporation, having hundreds of wagons at their barns or stations, and store sufficient gasolene, amounting to thousands of gallons, to operate them all? This is a vital point, as no system can be properly considered to have general utility which is handicapped by its own inherent dangers.

(1) As to noise. The electrical vehicle is almost noiseless. It does not begin to make the noise that even a horse makes on a dirt road, while a gasolene vehicle must, perforce, make a continuous puffing noise, due to the exhaust from the motor, and this is not only disagreeable, but to some people alarming.

(3) Vibration. Owing to the rotary action of an electric motor, no vibration of any kind is communicated to the vehicle, whereas, in a gas or gasolene engine, which is operated by the explosive force of gas or vapor in a cylinder, there is a constant jarring and vibration, due both to the explosions and to the rapid reciprocating motions of the piston and rod, and its connections through a crank to the fly-wheel.

(4) Heat. As there is no fire or consumption of fuel in any way on an electrical vehicle, there is, of course, no heat developed; but in a gasolene vehicle, the constant ignition and explosion of the gasolene raises the temperature of the cylinder to such a point on a long run as to prevent lubrication of the cylinder, and to endanger the successful operation of the motor. To prevent this trouble, water circulation is necessary, and very often even this is not sufficient, and ice in quantity has to be carried in order to keep the cylinder cool enough to allow the motor to perform its normal work.

(5) Odor. Of course, there is absolutely no odor connected with an electrical vehicle, while all the gasolene motors we have seen belch forth from their exhaust pipe a continuous stream of partially unconsumed hydrocarbon in the form of a thin smoke with a highly noxious odor. Imagine thousands of such vehicles on the streets, each offering up its column of smell as a sacrifice for having displaced the superannuated horse, and consider whether such a system has general utility or adaptability.

(6) Simplicity of construction. Aside from the æsthetic considerations above enumerated, the electrical vehicle admits of a simplicity of construction which it is impossible for a gasolene vehicle ever to attain. No engine, gas or steam, was ever built that at all approaches in simplicity an electric motor, and when such a motor is geared direct to the driving wheel by a single pinion on the armature shaft, it would seem that the very last degree of refinement in simplicity of construction had been reached in the electrical vehicles under consideration. Compare this construction with the marvelously complicated driving gear of a gasolene vehicle, with its innumerable chains, belts, pulleys, pipes, valves and stop-cocks, etc., and then put the question—Is it practicable? Is it not reasonable to suppose, with so many things to get out of order, that one or another of them will always be out of order? Does so complicated a structure possess the elements of general utility and adaptability?

(7) Ease of handling. The last point considered naturally brings us to the next feature, ease of handling. With so complicated a mechanism as that described above in the case of gasolene vehicles, it would be absolutely essential to have a skillful engineer and machinist to operate them. While it might be possible to instruct an ordinary man or woman how to steer the machine and to put on or take off the power, yet, for its successful operation, this would not be sufficient, as it would be imperatively necessary for them to be familiar with any or all the troubles that would naturally arise from imperfect mixture of the air and gas, or the proper amount of gasolene necessary to feed into the mixture, and, in fact, to possess a working knowledge of the various parts of an engine and how to keep them lubricated and in proper working condition; whereas, on an electrical vehicle, we can take a boy 12 or 14 years of age, or a young lady accustomed to driving a horse, and, with 10 minutes' practice, they can operate the vehicle perfectly. Of course, we do not mean to claim that no technical knowledge is required in connection with electrical vehicles; on the contrary, the proper care of batteries requires skillful and intelligent workmen; but such work is independent of the operation of the vehicle, and is, in fact, done when the vehicle is not in use. Once placed, the charge batteries on the vehicle, and you are ready to start, without any complicated conditions being complied with.

(8) Perfect control. This point has to do with the steering apparatus and the method for regulating the speed of the vehicle. While a safe and certain method of steering is essential in a motor-vehicle, there are many ways of accomplishing the same result. We have employed three different methods, all of which work satisfactorily. The regulator for controlling the speed is worked with the left hand, and the current can be turned on or off instantly, and the vehicle brought to a standstill by a brake worked by the foot, and then, if so desired, made to go backwards. The steering is accomplished by the right hand, and can be done with the nicest degree of accuracy in any direction.

(9) Cleanliness. This point properly belongs to the æsthetic condition first mentioned, but the electrical vehicles enjoy a marked advantage in this respect over their gasolene competitors.

(10) Economy of power. It is proper for us to state that we do not believe any of our competitors can show such small losses of power for internal work as we do in our machines. As a result of this, we are able to do the same work with a smaller expenditure of energy. For example, during the tests of our vehicles which were made in Chicago, we developed a speed of over 20 miles per hour with an input to the motors of less than three horse-power.

(11) Economy of operation. As to this point, the cost of operating a motor-vehicle by either electricity or gasolene is so small as to be almost negligible, or, in our case, ¼ cent per mile.

(12) Cost. In the matter of cost, we feel that we can decidedly underbid the gasolene vehicles, on account of the much simpler form of our construction. For example, the vehicle under test can be sold at a handsome profit for from $1,200 to $1,500.

(13) Elegance of design. This last point, while the least important of all those discussed, should be given its due proportion of merit. This is a matter that must necessarily be left to the carriage builder; but, owing to the extreme simplicity of the mechanical equipment of an electrical vehicle, compared with a gasolene motor-vehicle, it would seem as though it would be a much easier problem for the carriage builders to solve.

From a table published by the Equitable Electric Railway Construction Company, as to the horse-power necessary to propel 1,000 pounds, at various speeds and up various grades at same speed, I find that, on a level rail, at 12 miles per hour, it requires 0.320 horse-power per 1,000 pounds. While we have had but little opportunity to test our new machines, it is interesting to compare the few readings which we have already obtained with this table. These readings have all been obtained from Electrobat No. 2. Assuming the weight of vehicle and two passengers to be about 2,000 pounds (1,650 pounds of vehicle and 350 pounds passengers), the horse-power required for speeds Nos. 1, 2, and 3, on levels, is as follows:

SPEED.	AMPERES.	VOLTS.	WATTS.	MILES PER HOUR.	HORSE-POWER.	HORSE-POWER ON RAILS.
1....	6	96	576	5	.77	0.866
2....	15	96	1,440	12	1.90	0.64
3....	30	96	2,700	20	3.63	1.066

Trautwine gives 91 pounds as the tractive effort required to move a ton 10 miles per hour, on levels; this is equal to 2.4 horse-power. As we have been able to move a ton 12 miles per hour with 1.9 horse-power, we must attribute the increased efficiency obtained to pneumatic tires and ball-bearings.

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"A vehicle propelled by storage batteries is absolutely free from danger to life or property," says Mr. Salom. As a general statement, this is manifestly untrue. An electric vehicle may be defective in steering or speed control, in which case its use is surely attended with danger to life and property. The "loss of life and destruction of property" which Mr. Salom says will be a result of the general introduction of the gasolene vehicle, is a figment of the imagination.

The "continuous puffing noise" and the "constant jarring and vibration" have been done away with in the latest types of the gasolene vehicle, and the heat developed in the gasolene motor in no way inconveniences the passenger, who is far removed from it. It is true that water is required to cool the cylinder of the present gasolene vehicle motors, and that unless this water is removed from time to time the operation of the motor is impaired, but the implication that even when the water is renewed the same trouble is likely to arise is unfair. The use of ice to cool the cylinders of a wagon motor certainly borders on the ludicrous, and should never have been allowed in a public contest. The evil result of the error of the judges of the Chicago contest in allowing one contestant to carry a supply of ice, is now seen in the unfair use which the champion of the electric vehicle makes of the incident. The uninformed reader is warranted in inferring that this necessity occasionally arises with all gasolene vehicles. This is not true, however. Water alone is needed.

If Mr. Salom has seen no gasolene motors that do not "belch forth from their exhaust pipes a continuous stream of unconsumed hydrocarbon in the form of a thin smoke with a highly noxious odor," he has seen only the most inferior specimens, and should inform himself on recent improvements.

Under the next heading, "Simplicity of Construction," we are told that the construction of the gasolene vehicle is "marvelously complicated," and that its chains, belts, etc., are so "innumerable" that something must always be out of order. This is not the language of the scientist. The valves, stop-cocks, chains and pulleys of a gasolene vehicle can easily be counted, nor is there any "marvelous" complication about its construction. Furthermore, the liability of a motor vehicle to get out of order does not depend altogether upon the number of its valves, pulleys, stop-cocks, chains, etc. Inherent weaknesses in a simple construction may greatly add to this liability.

What the essential difference is between "ease of handling" and "perfect control," as applied to a motor vehicle, is not clear. Both have reference to the operation of the vehicle and are apparently synonymous. It is also somewhat difficult to understand why "the proper care of batteries," which "requires skillful and intelligent workmen," is independent of the operation of the electric vehicle, while the skilled work on the gas motor is not independent of the operation of the gasolene vehicle. Expert abilities are occasionally required for both, and as between the two, up to the present time, the gasolene vehicle has certainly not proved more troublesome than the electric.

The figures given by Mr. Salom under "Economy of Operation," and "Cost," will bear revision. In fact, the most fitting commentary on the whole article would be an absolutely true report of the Chicago race, from which it would be seen that there are two sides to the case.

To the Capitalist.

CAPITAL finds no more inviting field at the present time than the nascent motor business of America. Never before in the country's history did demand so exceed supply. Through the wide publicity that has been given to the motor vehicle, and the educational influence of modern methods of locomotion, thousands of people in this broad land are besieging inventors for the coveted improvement, yet capital seems slow to come to the inventor's assistance and bridge the gulf between demand and supply.

Again, but with greater emphasis, will the history of the bicycle repeat itself. Enormous manufacturing plants will spring up. Fortunes will be made. A giant industry will be the outcome, and those who wisely venture first will mould its destinies. Unlike those in older competitive lines, the manufacturers of motor vehicles will soon be too busy to feel the temporary fluctuations of politics and the money market. The bond issue, the new tariff or foreign complications will not concern them much. So generously does civilization treat those who have the foresight and the courage to supply her immediate needs.

Of this magnificent trade the cream will surely be taken by the pioneers, who read the public mind aright, put themselves quickly in touch with it, and prepare to supply the demand. This, in brief, is the philosophy of business, and its practical application to the capitalist to-day is—are you aware of the opportunity ?

The Rhode Island Race.

We call attention to the prize offer of the Rhode Island State Fair Association, particulars of which will be found elsewhere in this issue. The prizes are sufficient to call forth the best efforts of our inventors, and the facilities of the Association for organizing and conducting an enterprise of this kind are unexcelled. Time for preparation is ample and the season is propitious. Under such favorable conditions the ambition of American inventors should be stimulated, and a goodly number of competitors mustered at the start.

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When the horse is taken away from the vehicle there is a considerable saving of room. The power of the horse is limited, while the power of the motor in a sense is not limited. Motors of 50 to 75 horse-power may be placed in wagons if desired, and the question arises whether it will not be found desirable in the not distant future to build larger trucks or road wagons than are now in use for hauling merchandise or passengers in cities.

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Mr. Salom seems to be one of the numerous writers on the motor vehicle who cannot find a uniform and consistent terminology. His article is entitled, "Automobile Vehicles," the first term being borrowed from the French, and a very excellent term in that language, but no more adapted to our wants than "chemin de fer" would be as a substitute for railroads. The English language is rich enough to furnish its own terms, without any borrowing from foreign or dead languages.

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The weight of the horse and the method of attaching the animal to the vehicle have a steadying effect upon the vehicle. With the elimination of the horse, side shake and vibration have much freer play. Hence a very good and sufficient reason for building a motor vehicle low, to give greater stability and lessen side strains.

Speed in a boat depends largely on the amount of displacement. A powerful motor in a boat of large displacement is less effective than a motor of smaller power in a boat of smaller displacement. There is a strong demand for fast boats all over the civilized world, and this is leading rapidly to the construction of light motors of high power, to drive boats of small displacement.

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The editor has recently received subscriptions from the West Indies, Norway, Ireland, Scotland, India and Mexico.

Giant Tube Works Locate in Massachusetts.

The Mannesmann Cycle Tube Co. was recently incorporated under the laws of New Jersey to manufacture rolled steel tubing under the well-known Mannesmann process. The Mannesmann tubing has a world-wide reputation, several large plants being kept busy in Europe turning it out to supply the world's markets. A very important market for this product has grown up in America in consequence of the development of the bicycle industry, a market which, up to the present time, has been supplied by importation from the European mills, but the growth of the business made it almost imperative that a new plant should be started here. As soon as the American plant is in operation all importations will cease.

The site chosen for the works is the old Zylonite property at Adams, Mass. including a most valuable water privilege.

The company will make a specialty of cycle tubing, but will also turn out other sizes and styles of tubing, including those adapted for motor vehicles.

The capital of the company is $3,000,000, and the incorporators are: Robert Mannesmann and William V. Sherman, of Hoboken, N. J.; J. Reinhardt, Albert and Carl Mannesmann, of New York City; W. H. Hill, of Boston; Richard A. Burget, of Pittsfield, Mass., and L. L. Brown and Emil Kipper, of Adams, Mass.

Keely Stockholders Reorganize.

The stockholders of the Keely Motor Co. held a second meeting at Philadelphia on April 2, to settle upon some plan by which the conflicting interests in the company could be harmonized. The proposition which was brought before the meeting went through by a vote of 42,322 shares to 3,904.

The committee appointed at the last meeting to make an investigation of the new discoveries of Mr. Keely reported that they had seen enough of the new etheric vibratory system to convince them that it was the greatest invention of modern times.

In the proposed reorganization Keely will have one-half the stock, the motor company's stockholders one-fourth, and one-fourth will be put into the treasury as working capital. Keely will leave one-third of his holding with the company to satisfy the "assignments" he has given, and one-twelfth to cancel other obligations. No new stock is to be issued until a commercial motor has been constructed and applications for patents have been made.

Speed and Safety.

BY M. H. DALEY.

In studying the needs of the public for the motor vehicle, I must consider speed of the greatest importance.

The horse has supplanted the ox on account of speed. The power of the horse is less than that of the ox for drawing heavy loads, especially through mud and bad roads.

The limit of speed of horse vehicles for carrying passengers or freight on common country roads is the ability of the horse to travel and pull the load, humanely considered. Often the horse is abused for his inability to travel faster.

The speed of the bicycle is only limited by the ability of the operator to exert sufficient power. Safety on the bicycle is not the prime factor to be considered, because reasonable safety is sure at a much higher speed in the hands of an ordinarily careful person.

The speed attained on the bicycle is far in excess of that of a carriage drawn by the horse.

From a careful study of the problem I draw the conclusion that what we need is more power to propel the vehicle in order to travel faster. This is the prime incentive that is pushing men to the adoption of motor vehicles, for carrying not only passengers but freight. There is no dodging this self-convincing truth. There would be no call for the motor vehicle if greater speed was not desired.

We must not lose sight of the fact, however, that greater speed must bring greater danger of collision or accident, for people are not all wise or careful.

It has been said that "large bodies move slowly," which brings the inference that small bodies may move with greater speed. Observe animals and birds and you will see that the sparrow can start on its flight and stop much quicker than the goose or eagle. The rabbit is much spryer than the elephant. There is good cause for this. Momentum is in proportion to speed and weight, and the power required to stop or start any object is in proportion to its momentum. Therefore, objects of light weight may travel with greater speed with the same degree of safety.

Applying this theory to the motor vehicle, it will readily be seen that a motor carriage of light weight can travel fast with far greater safety than one that is heavy.

A light-weight motor carriage can turn shorter corners or turn quickly to avoid collision without danger of upsetting; when running at high speed, can be started with less power and stopped much quicker than a heavy one. It costs less to run it, especially on bad roads; it will sink less in mud and gather less mud upon its wheels.

In inventing a motor vehicle, I take into consideration:

First, the requirement of the public, which is speed and safety.

Second, how to attain the desired result, which, in the motor carriage for passenger traffic, I find to be light weight.

To attain light weight and secure proper strength, the vehicle must be constructed of as few parts as possible, designed to give great strength in proportion to weight, by the proper placing of each part to ensure utility. No superfluous parts or material must be allowed to enter into its construction.

To ensure great strength with light weight the selection of material is important. It is necessary to use material that will give the greatest possible strength in proportion to its weight, and the shape whenever possible should be tubular, even to the bolts. Great care should be given to proportion the different parts so as to avoid weak joints.

I have taken time to carefully consider the question in detail and not rush before the public with a clumsy vehicle capable of traveling somehow to satisfy the eager demand for a novelty.

There is no trouble in devising mechanism to drive a shaft by power with wheels on it to roll upon the ground if no consideration is given to weight, speed, safety and utility. It is easy to take an engine of two or three horse-power, set it in a cumbersome vehicle sufficiently strong to carry the engine and a couple of passengers, by using belts, chains or gears, to connect the power of the wheels and applying the mechanism of ordinary traction engines to steer the vehicle. But when we reduce the weight to get speed and safety and consider the necessity of a variable speed, ease of steering to avoid obstructions and collisions, great power for hill climbing and muddy roads, and less power and great speed for smooth roads, the case is different.

We find no motor of light weight ready to hand which is suitable and no vehicle constructed or designed to meet the requirements.

Every part has to be designed with a view to attain that one great desirable object—speed with safety. We find no wheels ready to hand constructed suitable for such a vehicle. In short, no part of the horse vehicle will answer the purpose.

Ordinary engines, either gasolene or steam, are too heavy, and the same difficulty is met with in applying electricity. In fact, at every step, invention is required. We must construct a light motor and a light carriage, having at least two horse-power to propel it, and this power must be so applied as to give a pull of five horse-power at the rim of the wheels whenever required, and to slide gradually from power to speed at the will of the operator.

Light vehicles are more susceptible to vibration than heavy ones. An ordinary gosolene motor of say 100 pounds, in a vehicle weighing about the same, will shake the vehicle so as to make it very uncomfortable to ride. Hence the urgent necessity of doing away with vibration.

No wonder that the cry is against speed by the inventors of motor vehicles. No wonder they keep near shore on the broad sea of experiments, and cling to old-fashioned vehicles and heavy motors, and deride high speed, crying unsafe.

But despite the wishes of our friends the stubborn facts remain that speed is the great desideratum.

In the solution of this problem of vibration I must confess that the different suggestions in THE HORSELESS AGE, and the methods there set forth, have been of great help in directing me to a possible solution of the problem.

Vibration in any body is caused by lack of an equilibrium of force. If a steam boiler explodes by the giving way of a part of the surface against which the steam presses, the boiler will be blown in the opposite direction, because the pressure is released on the side that gives way before it is on the opposite side. The same is true of the gasolene engine. When the gas is exploded there is a release of pressure. As the piston moves out there is a giving way at that end of the cylinder, and the extra force against the cylinder head causes the cylinder to "kick," as we term it. To avoid this "kick" two cylinders at opposite sides of the crank shaft have been used, both fired at the same instant, but still we find it difficult to get the explosions exactly alike, and the result is a double impulse that causes vibration.

This suggested to me the use of one explosion utilizing the motion in both directions. The cylinder traveling in one direction and the piston in the opposite, and both being connected to a double crank shaft, makes a perfect equilibrium of force and momentum. I find this relieves the bearings of the motor shaft from any thrust and allows the use of ball bearings to reduce the friction of the motor. It also makes possible a lighter construction of the motor, accomplishing the desired result with fewer parts and less weight.

This point obtained, we find others of equal importance, such as the doing away with the water jacket, the constructing of a variable speed device so as to get any range of power or speed, substituting one for the other, the application of the power to revolve the wheels without the use of belts, chains or cog gears, thus dispensing with the appearance of a machine, etc.

Step by step the inventor is pressing on in that vast field of the unknown, bringing forth the jewels that have lain buried for centuries from the mind of man, while the populace cry crank, failure, fool! and apply other epithets as encouraging. How little the people who now ride in comfort and safety on railway trains or street cars realize the struggles of the many inventors who brought forth the facts of applied mechanics that now enable them to use these agencies unknown to past ages!

Take courage, fellow-searchers in this new field of exploration. Success will crown our efforts!

The Locomotives on Highways Act of 1896.

The London *Engineer* gives in a recent issue the full text of the bill recently introduced into the English Parliament in favor of motor carriages. The bill, intended as an amendment to the Highways and Locomotive Act of 1873, rescinds all previous restrictive enactments, provided the vehicle be less than two tons in weight unloaded, be not employed in traction, and discharge no smoke or visible vapor.

The amendment reads as follows:

(1) The enactments mentioned in the schedule to this act, and any other enactment restricting the use of locomotives on highways and contained in any public, general, or local and personal act in force at the passing of this act, shall not apply to any vehicle propelled by mechanical power, if it is under two tons in weight, unladen, and is not used for the purpose of drawing any other vehicle, and is so constructed that no smoke or visible vapor is emitted therefrom, and vehicles so exempted are in this act referred to as light locomotives.

Provided as follows:

(*a*) Nothing in this section shall affect any power for the general regulation of traffic on highways, and a light locomotive is hereby declared to be a carriage within the meaning of the enactments relating to highways;

(*b*) Section 26 of the Highways and Locomotives (amendment) Act, 1878, and the enactments relating to hackney carriages and stage carriages respectively, shall apply to light locomotives as if they were drawn by animal power, and the said Section 26, as so applied, shall extend to London; and,

(*c*) So much of Section 6 of the Locomotives Amendment (Scotland) Act, 1878, and of Section 6 of the Public Health (Ireland) Amendment Act, 1879, as gives power to regulate the use of locomotives shall apply to light locomotives.

(2) The keeping and use of petroleum or of any other inflammable liquid or fuel for the purpose of light locomotives shall be subject to regulations made by a Secretary of State, and regulations so made shall have effect notwithstanding anything in the Petroleum Acts, 1871 to 1881, and breach of any such regulation may, on summary conviction, be punished by a fine not exceeding £2.

(3) If any person negligently drives a light locomotive, or suffers it to be without due control, he shall be liable on summary conviction to a fine not exceeding £10.

(4) The local government board may make regulations with respect to the use of light locomotives on highways, and a breach of any such regulations may be thereby made punishable by a fine not exceeding £10, recoverable on summary conviction.

(5) This act may be cited as the Locomotives on Highways Act, 1896.

As to width of tires and other features of construction county authorities are to exercise jurisdiction as under the act of 1873.

FOREIGN NOTES.

Aluminum is now undergoing experiments at the hands of some of the French motor vehicle builders.

The London Road Car Co., and the Compagnie Generale des Omnibus of the same city are simply waiting for the repeal of the "Road Locomotive Act" to introduce motor buses in the English metropolis.

The Motor Car Club, of London, has presented to the Automobile Club, of France, a massive silver piece representing a motor vehicle, with the request that it be given to the winner of the Paris-Marseilles race next Summer.

According to a recent police report there are 426 motor vehicles in use in the City of Paris, and a large number in the provincial districts. In Brussels there are said to be about half a dozen, the backwardness there being described to the state of the roads.

An exhibition of motor vehicles is to be opened in Brussels after the close of the Exposition du Cycle. A number of Benz wagons will be shown, as well as a representative line of M. Delner, the Belgian manufacturer. Five French manufacturers have also agreed to participate.

The Automobile Club, of Belgium, is organizing a motor vehicle contest from Paris to Spa. Quite a number of subscriptions have already been offered by cities along the route, including one of 15,000 francs from the municipality of Spa alone. The Motor Car Club, of London, has offered a magnificent silver trophy as a prize to the winner.

A large bicycle manufacturer of Belgium is reported to have secured an option on the Kane-Pennington patents for Belgium, and is said to be organizing a company, with a capital of 500,000 francs, to manufacture this motorcycle. We are further informed that 11 of these motorcycles have already been sold, the first one being destined for Prince Albert, of Belgium.

The new motor cab company at Paris, of which M. Roger is the head, has a capital of 700,000 francs. During the Summer it is the company's intention to introduce 40 of their motor cabs in Paris, and 30 in Lyons. As the company builds motors strictly, and a suitable design for a motor cab it not easily found, M. Roger offers a prize for the best design adapted to the purpose. The winner will secure the contract to build all the cabs the company will put out this season.

The Aerocycle

is a bicycle or other vehicle operated by compressed air or other elastic gas as the motive agent for pace-making races or ordinary road use. It is capable of the highest attainable speed, determined largely by the smoothness and character of the surface upon which it runs.

The air may be compressed in the storage reservoir manually or by steam, caloric or gas engine, by electricity, water, wind or other natural force in combination with an air pump. For this purpose an air pump may be an incorporated part of the machine, but preferably it is a separate apparatus. A pressure gauge, conveniently located at *a*, Fig. 1, would show the rider the degree of density carried, so that he would know, when starting, the distance the machine would travel before the motive power was exhausted and act accordingly; if, by accident or otherwise, the motive power became exhausted, the rider may lower the saddle until the feet touch the ground, and proceed in the manner the first bicycle was propelled, manually, *i. e.*, a walking motion of the legs, the feet tipping the surface. The wheels are entirely free on ball bearings.

The motor is of the turbine or rotary type and exhausts *one* port at a time, which is accomplished by having one more impinging or eduction port in the engine than there are induction ports. If the number were the same evidently they would all exhaust simultaneously though intermittently. As shown, they exhaust in rotation practically continuous, though one at a time. If this were found too great a drain on the store of energy, and taking also into consideration the other engine of the pair, the remedy is found in constructing them with another eduction port eliminated. The pair of engines are entirely independent, and it is intended that one engine shall be sufficient to propel the machine on a level gradient and at moderate speed; for grades or higher speed the other throttle is opened and the two act in unison. The higher the speed, other things being equal, the greater the economy of the stored energy. It is apparent that both wheels may be made drivers. When found necessary or advisable to heat the air after leaving the storage receptacle to increase its tension and hence its economy, or prevent the formation of frost at the exhaust, this is accomplished by using an electric generator operated by contact with either of the supporting wheels, the current from which passes through resisting conductors located in the air passages running to the engines. If more heat were required at one place than another the conductor is reduced in sectional area, or what would amount to the same thing, a higher resistance material would be used at that point. When coasting or when a heating effect is not required the generator is conveniently lifted from its spring contact with the wheel and ceases to act.

The suspended pendulating stirrups for foot rest and mounting may be arranged with a cross connection between them, which when the feet are moved rearward will engage against the rear wheel and act as a brake.

The concentric arrangement of the air reservoir has a twofold object, namely, a maximum available volume of air in a minimum weight and size of receptacle, and a compact reduction reservoir where the tension is reduced to the working pressure. For instance, if the reservoir 2, Fig. 9, will safely withstand a pressure of 3,000 pounds per square inch, then the inner reservoir 1, made of the same material, if you please, and having the same elastic limit (not taking into account the lesser diameter) will withstand a pressure of 6,000 pounds per square inch relative to the external atmosphere, and the available volume will be the sum of these contained within a receptacle which will safely withstand a pressure of 3,000 pounds only. By this arrangement atmospheric air may be compressed to nearly if not quite a liquid state, depending upon the thickness, diameter and elastic limit of the materials employed.

The method employed to keep the working pressure uniform is this: Suppose that 3,000 pounds and 6,000 pounds were the densities employed, I arranged on 1 a release valve which will open outwardly when 3,000 pounds presses against it. Now starting the compression in 1, when it amounts to 3,000 pounds, the valve will raise, permitting the excess to enter 2, until it equals 3,000 pounds, and the operation is complete with 6,000 *relative to the outer air* in 1 and 3,000 pounds in reservoir 2. With these as starting conditions the air in reservoir 2 is used and drops in pressure gradually to any amount, the pressure in 1 increases outwardly a like amount when the valve will raise and make up the deficiency for uniform working density until the pressure in 1 drops to 3,000 pounds relative to the outer air when the working pressure in 2 is exhausted. This may then be released into the working chamber 2 by cock *c*.

A pressure gauge *a* showing the density 2 will also indicate the density in 1 without direct connection with it; for example, if the gauge read 1,500 pounds, the pressure in 1' relative to the outer air will be 3,000 pounds, or for any reading just double down to the point when the release valve fails to act.

Another way, not automatic, to keep the working pressure uniform is to make the air duct *e'* very small and feed the air through cock *c* to the working cylinder, as the gauge shows it to be necessary.

Fig. 1 is a side elevation of aerocycle, showing its general conformation; *a* pressure gauge, *c* foreway cock, *g* electric generator. Fig. 2 is a rear elevation of same, *t t* throttles, *h h* engines. Fig. 3 is a section through engine on line *x x'* of Fig. 4, showing air chamber *3*, rubber gasket *4*, the induction and eduction parts, or male and female parts of engine and the central retaining axle *5*.

Fig. 4 is a longitudinal sectional elevation of driving axle and engine, showing the engine incorporated with the hub. The whole is held together and ball bearings made adjustable by nuts 7, on both ends of central axle, or bolt *5*, the latter showing a central passageway for electric conductor. Fig. 5 is a view of nut *6*, having right and left-hand threads. By removing the nuts *7* from the ends of central axle *5* and the nut *6* the engine comes apart and the wheel is removable from the frame. The revolving parts of all sectional views are represented in black, the other parts being stationary relative to the wheel. Fig. 6 shows sectional view of engine arranged on the cut-off plan. Fig. 7 is a longitudinal section of same, and Fig. 8 is a sectional view of cut-off plan, the exhause taking place on diametrically opposite sides of the engine.

Fig. 9 is a side elevation part section of gas reservoir showing four way-cock *c*, safety valve *s*, and relief valve *r*. Fig. 11 is a cross section through same and Fig. 10 an end view. Fig. 12 is a diagrammatic view of electric connections showing ordinary insulated conductors running along or through the tubing of frame where no heat is desired, and connecting to high resistance conductors—such as German silver—when it is desired that heat shall be generated, such as the air passages leading up to the throttle and down again, thence through the central axle and up to the other throttle on other side of wheel and thence back to the generator, com-

Fig. I.

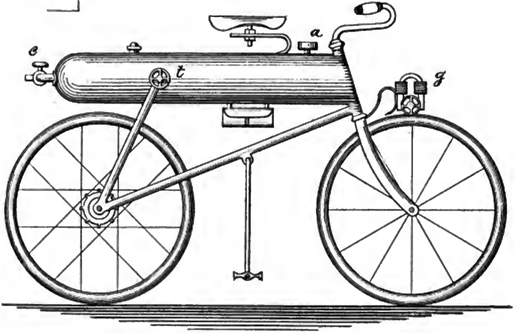
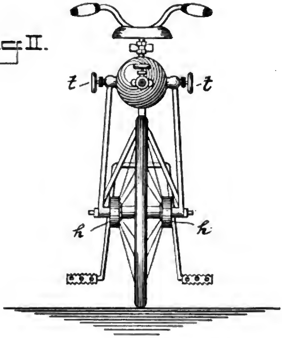


Fig. II.



AEROCYCLE. S. D. MOTT, PASSAIC, N. J.

Fig. III.

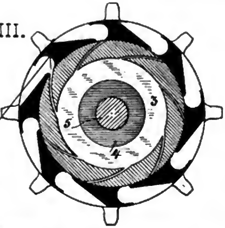


Fig. IV.

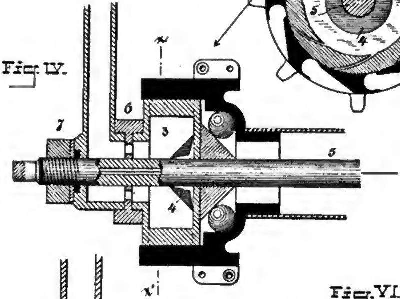


Fig. V

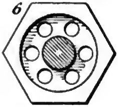


Fig. VI.

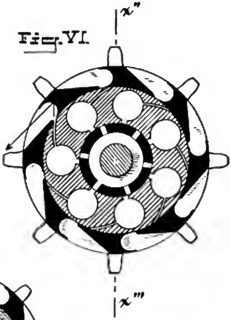


Fig. VII.

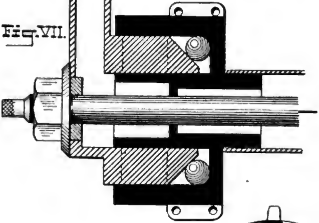


Fig. VIII.

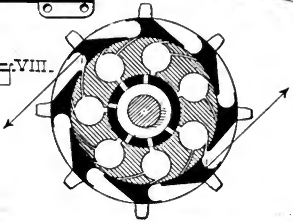


Fig. IX.

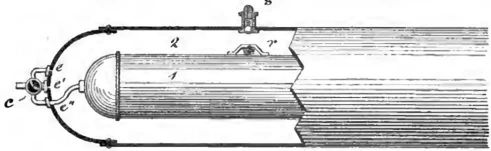


Fig. X.

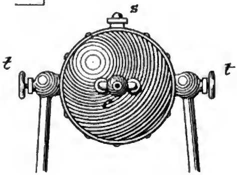


Fig. XI.

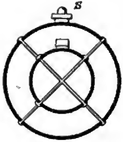
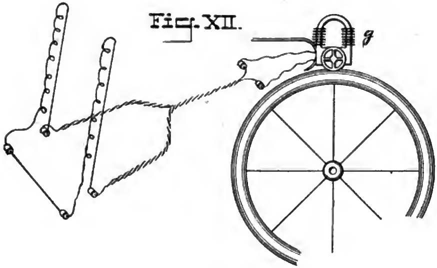


Fig. XII.



pleting the circuit. Thus heat is generated where it is desired to increase the tension and hence the economy of the driving agent, or prevent the formation of frost at the exhaust by the rapid expansion of the same.

The aerocycle is the invention of S. D. Mott, Passaic, N. J.

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Motor Cycle of H. K. Clovis.

H. K. Clovis, of Omaha, Neb., has invented a gasolene motor cycle which is said to be the result of seven years' labor.

The motor has two cylinders attached to the rear of the frame, one on each side. These cylinders are 9 inches in length, 2 inches in width and weigh 7½ pounds apiece.

The gasolene is stored in the tubing of the bicycle frame, the entire frame holding 3½ pounds, which is claimed to be sufficient to last 16 hours.

Power is applied to the rear wheel by means of cut rawhide gears, three to one, and as the motor makes 950 revolutions at full speed the distance traversed by a 28-inch bicycle wheel in this time would be about 800 yards.

The total power developed is said to be about 1¾ horse-power.

The method of vaporization and compression is described as follows:

"The fluid supplied from the frame is drawn into a vaporizer by the suction of the piston through a small tube passing into the vaporizer, the latter being supplied with a needle valve to regulate the flow of the fluid that is set before starting out, so that the proper amount of gasolene and air is drawn in. The piston travels up and causes a vacuum in the crank housing, which draws the air and gasolene into the housing and in the process mixes the air and gasolene sufficiently to develop the combination into gas. When the piston starts down it compresses the gas slightly, which passes into the corrugations below the cylinder, and, being released, rushes into the top of the cylinder and the piston rod starts its upward stroke, closing the corrugations. The gas is compressed in the top of the cylinder, where it is exploded by an electric spark, and the piston is driven downward until the exhaust valve opens and the burned gases are allowed to escape. The corrugations again opening, the same process is repeated."

The spark developer is fastened over the rear wheel, and is revolved by it. One revolution of the wheel is said to furnish current enough for three sparks.

Speed is regulated by a lever at the handle bar, so constructed that when all pressure is released the bicycle stops.

Sufficient power to drive the bicycle is furnished by one motor if desired.

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An Unsolicited Testimonial.

PITTSBURG, Pa., April 3, 1896.

Editor Horseless Age.

DEAR SIR:—I wish to say for the Empire that your paper has done more to advertise our motor traps and wagons than all the show we could make on the streets. We have received letters making all sorts of inquiry from all parts of the country, and now have many orders ahead. This was due entirely to the advertisement and notice in your last issue.

Yours sincerely,
EMPIRE MOTOR COMPANY,
Wm. Morgan, Manager.

The League to Issue a Bulletin.

The following circular letter has been issued by Messrs. C. B. King and H. D. Emerson, of the Executive Committee of the American Motor League:

Dear Sir:—After due consideration the Board of Directors of the American Motor League have decided to issue monthly, or if necessary more frequently, a bulletin. This bulletin will be solely for the information of members and will not be on sale for the general public. It will contain, in addition to news items of interest and technical papers, information solely for the members of the American Motor League. It will give the names and addresses of the agents of the league in each locality as they are appointed. It will be the means of communication between the members of the league. It is intended that all articles and communications in it shall be signed by the authors thereof. The editors will have no responsibility other than the compiling of the matter that may come to them from time to time. It is desired that you send immediately to either one of the undersigned such news in your vicinity as may be of interest to members of the league. This includes the names of owners and the name of the manufacturer of all automobile vehicles that you know at present, also the names of the manufacturers of various articles entering into the construction and the use of the automobile vehicles. It will be noticed that it is the intent to make this bulletin a journal of information for the user, the buyer and the seller. We shall be pleased to have you express your views on the subject.

We earnestly request that each and every member make it his special and particular object to get new members for the league. The field is broad and the league can be of great good to its members, and now in its infancy requires all the assistance that it can get. Individual solicitation will do more at this time than many letters or much printing.

Yours very truly,
C. B. KING,
H. D. EMERSON.

◆

BOAT MOTOR. P. F. OLDS & SON, LANSING, MICH.

Foster Gearing for Motor Wagon.

T. J. Foster, of Foster & Brown, machinists and founders, Westbrook, Me., has been carrying on experiments in the motor vehicle line for several years. The wagon illustrated here is at present minus a motor, the inventor having originally employed an Acme steam engine, which proved too small for the purpose. He now wishes to adopt a suitable oil motor, but as his attention has been entirely confined to the gearing or control of the power, a description of this is in order.

The wagon has three wheels, all turning on ordinary axles. The two rear wheels are fitted with sprocket wheels, fastened by clips to the spokes.

The engine was suspended from the under side of the body, and was carried by the springs. It was an upright, so set that its shaft lay lengthwise of the wagon, and having a bevel pinion on the outer end, which is geared into two bevel gears, fitted a "running fit" onto a shaft at right angles to the engine shaft. Both bevel gears were fitted with friction clutches, so that a forward or backward motion could be obtained by simply throwing the shipper to the right or left.

On the shaft with the two bevel gears are two rawhide gears, also fitted a running fit. A sliding key, moved by a lever, keys either gear to the shaft. The gears, which are two to one, engage two other gears, keyed to a shaft above the first shaft. This upper shaft has two small sprocket wheels in line with the sprocket on the rear wheels. Steering is accomplished by a quick-acting worm and worm wheel. By means of two sheaves and a section of sash cord the worm is revolved, thereby turning the steering wheel either way. This method of steering is exactly like driving a horse, so that the operator has nothing new to learn.

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It is highly probable that the Canadian Motor Vehicle Exhibition will be held in conjunction with the Industrial Exhibition in Toronto.

The Rhode Island State Fair Offers Substantial Prizes.

The Rhode Island State Fair Association, of Providence, R. I., propose to add as a leading attraction of their annual fair, to be held at Narragansett Park, for five days, beginning Sept. 7, a race and exhibition of motor carriages.

Prizes amounting to $50,000 will be awarded to successful contestants, both speed and general utility being taken into consideration in making the awards.

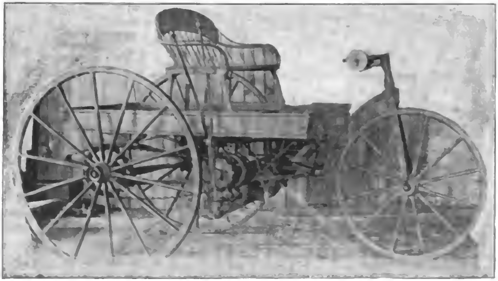
Narragansett Park, where the event will take place, is one of the best known fair grounds in the United States. The race track, which is one mile in length and 72 feet in width, is considered one of the fastest in the country. The grand stand is over an eighth of a mile in length, and has seating capacity for 10,000 people. The grounds comprise 67 acres, beautifully laid out, and perfectly equipped for racing and exhibition purposes.

The Rhode Island State Fair has a national reputation. For several years past it has been the most noteworthy event of its character in the New England States. Last year more than 125,000 people visited the grounds during the five days, and on the banner day, known as Governor's Day, 46,000 people were admitted. The entire outlay made by the Association last season amounted to over $85,000.

The section from which the fair draws its patronage is very populous. Boston is only 40 miles distant, Worcester much nearer, while all through Eastern Massachusetts and Western Connecticut are thriving towns that every year send an increasing quota.

With such an attraction as a motor carriage race and exhibition the management would, undoubtedly, see all previous attendance cast into the shade, as hundreds would come from distant points to witness the race.

The association is composed of men prominent in the commercial and social life of the enterprising Rhode Island metropolis, and the success of all past enterprises is a guaran-



GEARING FOR MOTOR WAGON. T. J. FOSTER, WESTBROOK, ME.

tee that this new departure will be pushed with the same energy and judgment.

The details are not all arranged yet, but they will be announced in THE HORSELESS AGE as soon as they are decided upon. Meantime American motor inventors should set to work to put their ideas into practical shape, so that they may be in season to compete for the substantial prizes and public recognition which will fall to the lot of the winners at the Rhode Island State Fair.

GRAND CENTRAL PALACE, LEXINGTON AVENUE AND FORTY-THIRD STREET, N. Y.

International Permanent Exhibition of Motor Vehicles.

Under this name a company has been organized in New York City to maintain a permanent exhibition of all industries and manufactures, and thus provide a great centre where both native and foreign buyers and the public may congregate for the examination of the world's products and the transaction of business.

The site chosen for this mammoth undertaking is probably unequalled in the United States. The Grand Central Palace, where preparations are now actively going on for the opening of the exhibition, is located at the corner of Lexington Avenue and Forty-third Street, only two short blocks from the Grand Central Station. It is a magnificent structure 200 by 240 feet, and seven stories in height. It was erected at a cost of over $2,000,000, and is of the most substantial construction throughout. Every modern convenience is found within its walls.

The management of the entire enterprise has been placed in the hands of R. Wayne Wilson, a gentleman well qualified by previous experience to handle it with success. Progressive in all things, Mr. Wilson wishes to make a special feature of motor vehicles, and has decided to set apart a considerable space for this purpose, with ample room for manoeuvreing and showing off the vehicles to visitors.

As an attraction to the public a roof garden is being fitted up where popular entertainments will be given and light beverages served. A tower extending high above the roof and illuminated with a brilliant electrical display by night, will advertise the exhibition for miles around.

With such an ideal building and location, and such experienced management and solid backing, the enterprise should prove one of the greatest attractions of the metropolis, and without a motor vehicle section it would scarcely be up to date.

So the management think, and they have appointed H. M. Bertody manager of the motor department of the exhibition, and all communications relating thereto should be addressed to him.

Complete Rules of the Paris Race.

The special committee of the Automobile Club of France having in charge the arrangement of the details of the Paris-Marseilles-Paris course has decided upon the following rules and regulations:

Article 1. The course shall be from Paris to Marseilles and return.

Article 2. Only vehicles propelled by other than animal power will be allowed to compete.

Article 3. The vehicles will be divided into two classes: First, one or two seated vehicles; second, those having more than two seats.

Article 4. A third class has been set apart for motocycles, or vehicles weighing not more than 325 pounds without passengers and appurtenances

The temporary use of pedals is allowed in the case of some motocycles.

These vehicles will be managed by a single operator, who cannot be relieved from duty during the entire course. They will be subdivided into two classes, one consisting of motocycles propelled wholly by motive power, and the other of motocycles in which pedals are occasionally used.

None of the motocycles will be entitled to a prize unless an average of at least seven miles an hour is made for the entire course.

Article 5. Vehicles of the first and third classes will be managed by one operator only. Those of the second class by two operators, who may relieve each other *en route*. Conductors can be changed at the regular stations.

Article 6. The number of vehicles is not limited, but contestants will not be permitted to enter too many vehicles of the same type and size.

Article 7. Each vehicle will be required to carry its number in figures 15 centimetres high. This number must also be legibly inscribed on the lamps so as to be read at night. No other printed or advertising matter will be permitted on the vehicles.

Article 8. Vehicles entering one month before the race will be required to pay an entrance fee of 200 francs. Those entering later will pay double, or 400 francs.

Article 9. Each vehicle will take along a "commissaire," or umpire, chosen preferably from among the members of the Automobile Club, whose duty it shall be to make a full report of the journey as it relates to the vehicle under his charge.

The umpires shall be chosen by the contestants, from a list of double the number necessary, furnished by the committee of the Automobile Club. They will be selected from among engineers and owners of motor vehicles, and not from the contestants or builders of motor vehicles.

The other seats will be occupied by invited guests, members of the Automobile Club still having the preference, or by dead weight on a basis of 165 pounds for each vacant place.

Umpires will be allowed to carry a limited quantity of baggage, not exceeding 12 pounds in weight.

Article 10. Besides the general committee of control, having in charge the entire course, there will be at each stopping-place a local control, consisting of members of the Automobile Club and the Touring Club of France, who shall take the time of the arrival and departure of vehicles from the parks or stopping-places, and also exercise a general supervision over the parks.

Article 11. These "controls" shall be indicated night and day by visible transparencies, plainly marked "Controle."

Article 12. The stopping-places will be:

Going; Auxerre, Dijon, Lyon, Avignon, Marseille.

Returning: Avignon, Lyon, Dijon, Sen, Paris.

The route willl pass through the following cities:

Melun, Montereau, Sens, Joigny, Auxerre (first stop.)

Avallon, Vitteaux, Sombernon, Dijon (second stop).

Chalon, Macon, Villefranche, Trevoux, Neuville, Fontaine, Lyon (third stop).

Vienne, Valence, Montelimar, Orange, Avignon (fourth stop).

Orgon, Salon, Aix, Marseille (fifth stop).

Article 13. Contestants will be permitted to make all necessary repairs *en route*. Duplicate parts such as the committee may deem necessary will be allowed to be carried in the vehicles. But it is required that all repairs be completed before the vehicles enter the parks; or in other words, time occupied in making repairs will not be deducted.

Article 14. The order of departure from Paris will be decided by lot. The vehicles will start off at the signal, at intervals of three minutes apart.

Article 15. In each city where a stop will be made a park or enclosure will be selected, where the vehicles will be inspected by the local *controle*, and the time of the arrival of each taken. A quarter of an hour will be allowed each conductor for the care of his vehicle, after which he will be required to continue the journey.

Repairs are expressly forbidden in the parks.

Article 16. The parks will be opened at 6 o'clock a. m., and by 7 o'clock all the vehicles are expected to have left them. The order of departure will be given to the contestants by a starter, in the order of their arrival.

Only the umpires, contestants and those who furnish the necessary supplies will be allowed in the parks.

Article 17. Each contestant is considered "gone" at the moment when the signal is given to him, and his time is counted from that moment, even though his departure is delayed.

Article 18. A contestant who happens to be delayed, and cannot reach the park before 6 o'clock in the morning, will not be admitted into the park, but will be timed by the control, and will be sent off after the other contestants.

Article 19. Contestants will be required to conform to such rules and regulations as may be made by the local control, particularly in regard to their respective positions in the parks.

Article 20. The sum derived from subscription and from the expositions and entrance fees, after deducting necessary expenses, will be divided in the following proportions:

Fifty per cent. to vehicles of two and four places, 40 per cent. to vehicles of more than four places, and 10 per cent. to motocycles.

The number and relative amount of prizes in each class will depend upon the number of contestants, but in such proportion that the first prize will be double the second, the second double the third, etc.

Article 21. Contestants of the first class who do not cover the course with an average of at least eight miles an hour will be disqualified, and for the second class an average of at least seven miles an hour will be required.

Article 22. On arrival at each local control the conductor and umpire of each vehicle shall notify the *controle* of the number of the vehicle, the time of arrival, the names of the persons occupying the vehicle, and the amount of dead weight, if any is carried.

Article 23. The time of arrival and departure will be taken from watches regulated by railroad time at the various stations.

Article 24. In case of protest or appeal from local decisions the conductor of the vehicle so protesting will be required to formulate his protest in writing and hand it to the local controle, who will forward it immediately to the committee having these matters in charge.

Article 25. Cases of disqualification will be finally adjudged by the committee only.

Article 26. Conductors will be required to fix their attention constantly upon the condition of the road before them, and to govern the speed of their vehicles according to circumstances.

Article 27. Whatever the speed, conductors will be expected to have their vehicles under control, so as to stop within a proper distance.

Article 28. The approach of vehicles must be made known along the route by such signals as horns, trumpets or some similar instrument of warning, but sirens or steam whistles will not be permitted.

Article 29. Vehicles that are compelled to travel by night will be required to show two white lamps in front and one red light behind.

The front lamps must shed a light broad enough to enable the conductor to bring his vehicle to a complete stop in case an obstacle or sudden danger is encountered.

Article 30. When one vehicle overtakes another in the way, the one in front shall turn to the right and allow the other to pass at the first request, without attempting to prevent the passing of its competitor, on pain of disqualification.

Article 31. If several vehicles come successively or at once upon an obstacle in the road, which compels the first to stop (accident, river bank, etc.), the vehicles will be required to stop one behind the other, and depart again in the order of their arrival, without attempting to pass each other.

Article 32. In no case will two vehicles be allowed to run abreast.

Article 33. All legal responsibility is thrown upon the contestants, the committee declining to assume any whatsoever.

Article 34. Two copies of these rules will be given to each contestant, who will sign a receipt for same.

Every subscriber to the amount of 1,000 francs becomes a member of the committee.

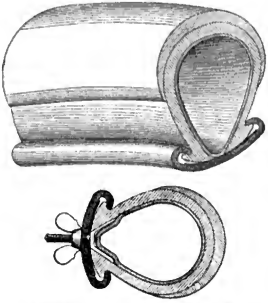
All correspondence relative to this race should be addressed to the secretary-general of the Automobile Club of France, 4 Place de l'Opera, Paris, France.

The office of the secretary-general is open every day except Sunday from 11 to 12 and from 1 to 6.

Pneumatics Used on Motor Cabs Abroad.

Michelin & Co., the well-known pneumatic tire manufacturers of Paris, have attached their pneumatics to a number of the public cabs of that city with much success, the results showing that if the power required to draw a pneumatic-tired cab be represented by 100, the power required to draw a cab fitted with steel tires will be represented by 139 to 156. In addition to the saving in power there is also a saving in wear and tear, and as vibration is reduced all through the vehicle, it can be built lighter with safety.

These experiments, it is confidently believed, will lead to the introduction of the pneumatic tire on motor vehicles.



MICHELIN PNEUMATIC FOR VEHICLES.

We reproduce from a French contemporary illustrations showing the construction and mode of attachment of the Michelin pneumatic.

The tire consists of an inner air tube surrounded by a heavy fabric or cover. On the tread the tire is reinforced by a thick layer of fabric treated with rubber.

The cover is secured to the rim by means of flanges fitting snugly under the corresponding flanges of the rim. Bolts are inserted to prevent the cover from creeping or rolling out of the rim when subjected to the severe strain due to turning in car tracks or on rough roads.

"Otto" Marine Gasolene Engines.

The Otto Gas Engine Works, Philadelphia, Pa., are putting on the market a line of "Otto" marine gasolene engines from 2 horse-power up to 100 horse-power or over.

The larger sizes down to 17½ horse-power have two cylinders, while those of smaller power have but one.

The two horse-power, which is designed specially for a yacht tender, is made entirely of bronze, and weighs 125 pounds. It is 18 inches high, sets fore and aft in the boat, and occupies a floor space 15½ x 9¾ inches.

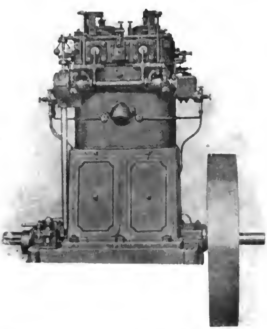
All are of the upright type. Vaporizers and carbureters are dispensed with, as well as the usual gravity feed, the engine pumping up its fuel as needed, and any surplus being returned to the tank by gravity. The tank can therefore be placed near the engine and on the floor of the boat if desired.

When two cylinders are used they are balanced to avoid vibration and cause the engine to stop on the quarter so that a simple touch of the igniter will start it again.

Speed is regulated by changing the supply of fuel. This is accomplished by a governing level which is said to be as sensitive as that of a steam engine.

Beyond the click of the valves the engine is noiseless in operation.

All connecting rods and shafts are of forged steel.



Electric ignition is employed, the current being furnished by a primary battery, made for marine use.

The engine illustrated here develops 50 actual horse-power, and weighs about three tons, including the fly wheel. It makes 360 revolutions a minute, and is automatically lubricated.

All these engines are built at the company's works in Philadelphia, but a New York office for the marine department has been opened at 29 Broadway.

The consumption of fuel is guaranteed not to exceed 1-10 gallon per hour for each horse-power.

M. H. Daley's New Carriage.

M. H. Daley, of Charles City, Ia., one of our valued contributors, whose common-sense articles on general motor subjects are read with great interest throughout motordom, is building a new carriage, which he expects to enter in the *Cosmopolitan* race.

This new carriage will have a longer reach than the one described in the December issue of THE HORSELESS AGE, and will be equipped with Mr. Daley's new motor, the Eureka, which is free from vibration, and has no water jacket, the cylinder being kept cool by a soft metallic belt passing over a revolving jacket on the cylinder. This belt carries away the heat on its slow circuit.

In the transmission of power no cog gears, belts or chains are employed. A friction clutch composed of two flange discs on the motor shaft, one disc smooth on both sides attached to the carriage axle, and two friction rods made to slide up or down between these three discs, are all the mechanism used for varying speed and power.

The discs on the motor shaft act as balance wheels. One of them slides on a feather to prevent turning on the shaft, and is moved by a lever, which at the same time moves the motor a very little in the opposite direction, thus making the pressure equal on both sides.

By moving these friction rollers toward the motor-shaft great power and reduced speed is obtained for starting, hill, climbing and muddy roads, and by moving them down toward the carriage shaft great speed, with less power, is secured.

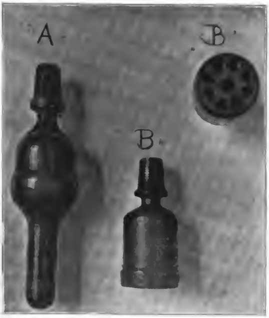
The object of using two rollers is to overcome all friction and end thrust on the carriage and motor axles or shafts.

The motor is placed so that the shaft is directly over the carriage axle, just high enough to clear the friction disc on the carriage shaft.

The Gardner Automatic Igniter.

This device, invented by L. S. Gardner and controlled by the Gardner Motor Company, Limited, of New Orleans, La., is claimed to overcome one of the chief difficulties in the operation of gas or vapor motors, and to allow the abandonment of continuous electric sparks or heated tubes.

This igniter (as shown by the above cut) is screwed inside the cylinder of the motor, and is constructed with a combination of metals so arranged that after a few explosions in the cylinder a certain part thereof remains incandescent, and thereafter ignites the charges with equal regularity and at the proper moment to give the best results, without the aid of lamps, electric sparks or heating apparatus.



These igniters are made in two designs, form "A" being used for motors using the Otto cylinder, and form "B" for all other forms, and are said to be so simple in construction that they cannot get out of order or refuse to ignite the charge when once in operation.

In order to get the igniter in working operation it is necessary to start the motor by means of an electric spark, heated tube or otherwise, but after a few revolutions the igniter will proceed to work without the use of fuel or heating apparatus, and continue to do so with regularity for an indefinite period, or until the motor is stopped.

It is claimed that by the use of this igniter the motor never misses an explosion, uses less fuel and gives better results.

TABLE OF PRESSURES FOR USE IN DESIGNING GAS ENGINES.

AIR COMPRESSION FROM ONE ATMOSPHERE AND 60° FAHR.								OTTO CYCLE.				
Gauge pressures.	Volume with air at constant temperature.	Volume with air not cooled.	Mean pressure per stroke. Air constant temperature.	Mean pressure per stroke. Air not cooled.	Mean pressure during compression only. Constant temperature.	Mean pressure during compression only. Air not cooled.	Final temperature. Air not cooled.	Explosion pressure gauge.	Final pressure gauge.	Ft. lb. per square inch per ft.; length of cylinder (fill and stroke).	Average pressure.	Gauge pressure of charge.
5	.7462	.81	4.3	4.5	2.22	2.26	106	91	64	14.3	75.3	5
10	.5952	.69	7.62	8.27	4.14	4.26	145	109	58.75	24.25	78.2	10
15	.495	.606	10.33	11.51	5.77	5.99	178	126	54.94	32.7	83	15
20	.4237	.543	12.62	14.4	7.2	7.58	207	142.5	52	39.445	86.3	20
25	.3703	.494	14.59	17.01	8.49	9.05	234	157.88	49.4	44.91	88.7	25
30	.3289	.4638	16.34	19.4	9.66	10.39	255	174	49.4	51.11	90.4	30
35	.2957	.42	17.92	21.6	10.72	11.59	281	189	46	55.3	92.4	35
40	.2687	.393	19.32	23.66	11.7	12.8	302	205	44.73	57.9	95.4	40
50	.2272	.35	21.79	27.39	15.48	15.05	339	228.75	41.06	63.5	96.2	50
60	.1968	.3144	23.84	30.75	15.05	16.89	375	255	38.43	67.87	99	60
70	.1735	.288	26	33.73	16.43	18.74	405	280	36.625	72.64	102	70
80	.1552	.267	27.33	36.6	17.7	20.5	432	302.5	34.65	76.81	105	80
90	.1404	.248	28.78	39.8	18.87	22	459	[illegible].72	33.666	79.52	106	90
100	.1281	.232	30.07	41.6	19.92	23.43	485	350	32.19	82.18	107	100

Prepared by Charles B. King, Detroit, Mich.

Foster's Reversible Propeller Wheel.

The reversible propeller wheel here described emanates from the fertile brain of C. W. Foster, the well-known mechanical engineer of New Haven, Conn., who has for some years past made a specialty of marine engineering.

The hub is perfectly round and smooth, no nuts or bolts being used in its construction. The blades are very thin and wide, and conform in outline to the true circle of the circumference of the wheel.

Neither blades nor hub have any lateral movement.

The wheel is supported entirely by the stern bearing so that the shaft is used only to revolve the wheel, and there is no danger of breaking the shaft and losing the wheel.

The blades are set at any desired angle from the engine room by one lever, which causes a lateral movement of the shaft. On the shaft is a lug which engages with a slot in the base of each blade, turning it at any desired angle. The blade is claimed to be stronger than one cast on the hub.

The hub is made in two halves, fitting so snugly together that no sand or mud can enter, and the little water that finds its way inside acts as a lubricant. Caps fit over the threaded ends of the hub and screw on a perfect fit.

The blades may be of any desired shape to suit the notion of the purchaser, or the purpose for which they are intended.

Samuel Lawson's 10-HP Kerosene Motor.

Samuel Lawson, of Welch & Lawson, builders of the Lawson gas engines, 205 Centre Street, New York, has just finished a 10-hp kerosene motor for a buckboard, owned by C. S. Fairfield, Portland, Me.

The motor which is designed to furnish sufficient power to propel a load of 24 passengers at a maximum speed of 10 or 12 miles an hour, is of the upright type, and has two cylinders with a stroke 6 x 7½ inches.

The total weight of the motor, fly-wheels included, approximates 800 pounds, the fly wheels weighing about 170 pounds each; the number of revolutions is from 300 to 500.

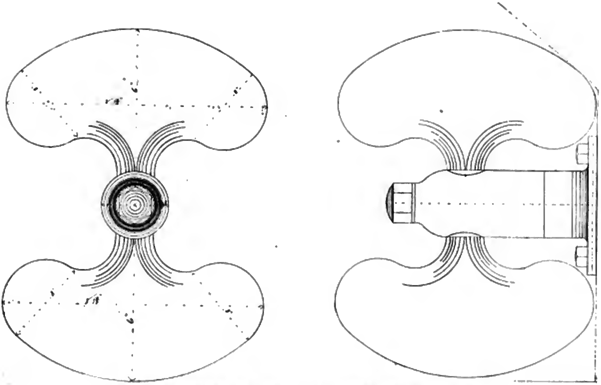
Poppet valves lifted by cams are employed, and their movement is said to be positive under all conditions.

Ignition is effected by a tube, but when the cylinders are heated up the flame can be extinguished and the motor will perform its work with the same regularity.

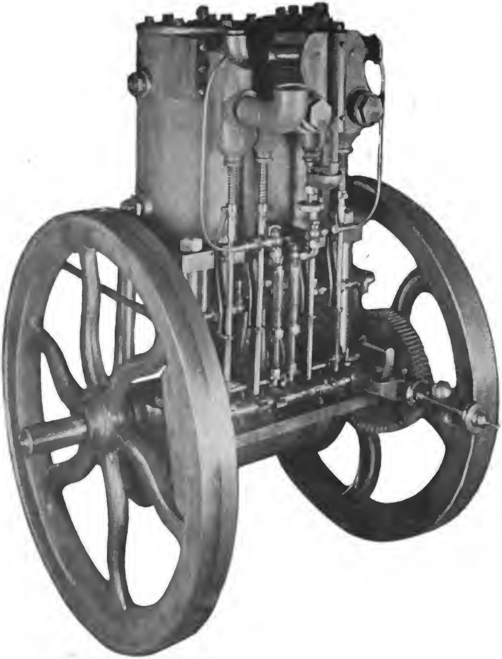
No oil is used in the cylinders or valves, the main crank and shaft being the only parts where it is found necessary.

The compression is about 60 pounds, and the ignition takes place under about 200 pounds pressure.

The buckboard is to be used for Summer excursion parties and Mr. Fairfield is to apply the power of the motor to the vehicle by means of a sprocket and chain.



REVERSIBLE PROPELLER WHEEL. C. W. FOSTER, NEW HAVEN, CONN.



10-HP KEROSENE MOTOR. SAMUEL LAWSON, NEW YORK.

COMMUNICATIONS.

Does Not Agree with M. H. Daley.

AVOCA, IA., April 17, 1896.

Editor Horseless Age:

DEAR SIR:—I presume there has never been a contemplated enterprise that has excited more general interest than the successful designing and manufacture of the horseless carriage.

Everything published regarding it is read with avidity, hence misstatements of the principles involved should not go uncontradicted. I wish to criticise an article in THE HORSELESS AGE for March, entitled "The Motor Carriage Not a Traction Vehicle," by M. H. Daley.

The article gives evidence of having been somewhat carefully written, hence the errors therein are the more to be criticised.

In the sense of not being a draft engine Mr. Daley is right in saying it is not a traction vehicle, but not in another sense.

There is no wheeled vehicle that is not a traction vehicle in one meaning of the word. The first error in the article complained of is a text for all the errors that follow.

He states: "The horse draws a vehicle by the friction of the feet upon the ground. This is not the case when the horse propels its own body or even a load upon its back." The last sentence is certainly a misstatement of a palpable fact.

Instead of this being true the fact is that for every pound of forward thrust of the body of the horse there is a corresponding pressure backward against the surface upon which the animal walks. Place a horse upon perfectly smooth ice and progression forward is very difficult, simply from the fact that there is not sufficient traction between his foot and the ice to propel his weight forward. Place the same animal upon a movable platform and he does not progress at all, but the backward thrust of his feet moves the platform instead, provided there is more traction between the platform and his feet than there is between the movable platform and its support.

This fact is well-known, and advantage is taken of it to obtain a very cheap and serviceable power for many farm and domestic uses.

If my statements are correct, there is but little need for me to particularize further as the whole article is based upon wrong premises.

"The vehicle can be pushed through mud six or eight inches deep if there is sufficient power," etc., etc. True, but the very presence of mud adds to the traction of the wheels. It is not under such circumstances that the wheels would slip, but under almost the opposite conditions, where the ground is slightly wet and thus does not present sufficient adhesive force to propel the carriage forward. Every one has probably seen the wheels of a thrasher engine slip on the wet ground until the engine was stalled.

From the premises he makes Mr. Daley deducts the following, which he prints in italics: "There is no more tendency of the wheels of a motor carriage, all wheels of which are driven to slip in traveling, than there is of the wheels of a carriage drawn by a horse." If he stated instead that there is no more tendency for the wheels of a motor carriage to slip than there is for the feet of a horse in pulling, then his statement would have been correct, with certain limitations; but as he states the proposition it is, I am sure, an inexcusable error.

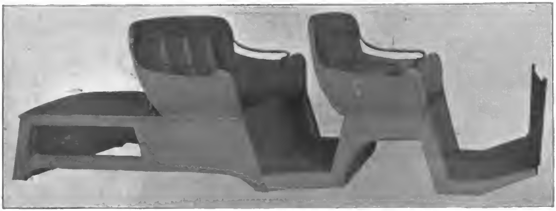
I do not think, however, that any designer of a motor would build his motor on such a basis of calculation, as I presume most of them would conclude that the wheels must have some fixed point from which to get their forward thrust, else they might as well turn in the air. CHAS. W. HARDMAN, M. D.

To Build Motor Carriage Bodies.

The Emerson & Fisher Co., Cincinnati, O., recently built for the H. Mueller Manufacturing Co., Decatur, Ill., a motor carriage body, which is illustrated here. The work was highly satisfactory to the Mueller Co., and the Emerson & Fisher Co. will give considerable attention to this class of work in future.

◆

Henry Lambree, an English actor, who has been playing in New York for some time past, was arrested recently for riding a motor cycle on the Western Boulevard at a faster rate than the law allows. The policemen had a hard chase in arresting him, and the magistrate who heard his explanation that he "was trying an experiment," discharged him with a warning that he had better hire a private track when he wished to try experiments again.



MOTOR CARRIAGE BODY. EMERSON & FISHER CO., CINCINNATI, O.

The "Hub" Ball Bearing for Vehicles and General Machine Construction.

The ball bearing is coming to the front all along the line. The bicycle has proved a popular educator in the merits of this modern friction saver, and now the demand for ball bearings extends not only to four-wheeled vehicles, but also to general machinery of all kinds, including the heavy machinery in mills.

The bearing which has been most energetically and successfully pushed for all these various purposes is the "Hub," made by the Ball Bearing Company, of Boston, Mass., whose advertisement will be found on another page.

This well-known device, invented by the late Geo. F. Simonds, represents years of patient study and experimenting. The special features which differentiate the "Hub" Ball Bearing Axles from all other forms of ball bearings, and are said to render them superior for heavy and light work, are as follows:

First: As many balls are used as are necessary to carry the load, while in other makes of ball bearings only a single row of balls at either end are used, increasing the strain and wear and the liability of breakage.

Second: Separate sets of balls are employed to carry the load and to take the "end thrust," relieving the balls from a large amount of wear.

Third: All the balls are confined in radial cages, enabling them to be handled in one piece—a great advantage when handling or cleaning the bearings. The arrangement of the balls in the cages is such that a broken ball can do no damage.

Fourth: When the parts become worn after long service repairs can be made at a mere nominal expense and without replacing all the parts with which the balls come in contact.

Fifth: The "axle sleeves," "axle washers," and the inside of the boxes are of steel hardened by a special process controlled by the company, securing perfection of size and avoiding liability of breakage.

Sixth: Friction and wear are so reduced that oiling is necessary at rare intervals only.

Seventh: No adjustment is required.

The "Hub" ball bearings are manufactured on the duplicate-part system, and every part subjected to wear can be easily and quickly replaced at small expense.

Wheels fitted with these bearings can be taken off or put on with little trouble, as thrust washers are dispensed with.

"Hub" bearings are practically noiseless, and such a thing as a "hot box" is impossible with their use.

The company lay great stress on the quality of the balls furnished in these bearings, which they claim cannot be excelled in hardness, strength and uniformity of size and finish. A guarantee accompanies every sale, whereby they agree to make good, within one year of the date of the sale, any defects not caused by misuse, neglect or accident.

The "Hub" ball bearings have been adopted by many of the leading carriage builders of the country, and have in every case proved their superiority over the old style axle. In a paper read before the Carriage Builders' National Association, at Philadelphia, Oct. 17, 1894, Mr. Sterling Elliott, publisher of *Good Roads*, stated that experiments had demonstrated the superiority of the ball-bearing axle over the ordinary axle to be as two to one. The many users of the "Hub" will accept this as a conservative estimate.

For motor vehicles the ball bearing is indispensable. Its usefulness is not confined to the axle but extends to machinery bearings, where friction and wear can profitably be saved. The saving effected by the "Hub" bearing wherever employed, is claimed to be greater than that obtained from any other bearing, a claim which is substantiated by the large number of motor inventors who now use it exclusively.

Manufacturers who are fitting up new plants, or refitting old ones, would do well to investigate the evidence which the Ball Bearing Company have to offer as to the great economy in power and repair expenses which mill owners have been able to effect by the use of the "Hub" bearings for all kinds of mill machinery.

Ran Foul of the Police Board.

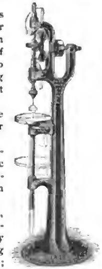
Thurman & Silvins, patent solicitors and mechanical engineers of Indianapolis, Ind., have been constructing a motor wagon for F. M. Cook, of Mt. Gilead, O., a client, and wishing to test it recently applied in writing to the Police Department for permission to use a certain street for that purpose. They agreed to exercise every precaution, and not to exceed a speed of 18 miles an hour. They did not ask that a perpetual license be granted, but that permission be given for one hour of a day to be named later.

The clerk of the Board answered the firm's letter and suggested that they call upon the Superintendent of Police and "see him in person." The words quoted above were underscored, and Thurman & Silvius thereupon wrote a second letter to the President of the Board, stating that they could not see why there should be any hesitation in granting the request, when bicyclists frequently made 18 miles an hour within the city limits. They also said they had no money to spend with the police department, and desired to deal with headquarters.

The Superintendent of Police then bristled up, and had his attorneys write a letter to Thurman & Silvins demanding an explanation of this language which he construed to be a charge of blackmail.

Thurman,& Silvius are very reticent about the matter, and it is quite likely that they may find it necessary to seek a place outside of the city to test their client's motor vehicle.

The Foster Variable Speed Transmitter.



The widespread interest in motor vehicles is bringing to the front many devices for the transmission of power and regulation of speed. One of these is the invention of C. W. Foster, of New Haven, Conn., who has applied it particularly to a drilling machine, known as "Foster's Patent Friction Sensitive Drilling Machine." Mr Foster believes that the same principle could be used as successfully on motor vehicles.

The device consists of a revolving face-plate of cast iron or steel and a friction disc at right angles to it, the latter being composed of leather clamped securely between two steel plates.

The centre of the face-plate is cupped, and by crossing this centre motion is reversed. The increase of speed is very smooth and gradual, the traction being equal to that of a belt of the same width; *i. e.*, one-inch face of disc is one horse-power, one and a half inch about three horse-power, etc.

In its application to a motor vehicle the drill spindle would represent the carriage axle, the face-plate the fly-wheel of the motor, and the shaft on which it revolves the motor shaft. The connection would therefore be direct, without the intervention of sprockets, chains or gears.

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Formal Opening of the Rooms of the Automobile Club.

The rooms of the Automobile Club of France, at 4 Place de l'Opera, Paris, were formally dedicated on April 15. The ceremonies were preceded by a banquet, at which about 60 friends of the cause were present. Baron Zuylen de Nyvelt presided, and Sir David Salomons, president of the Self-Propelled Traffic Association of London, was among the distinguished guests.

The club quarters comprise a spacious *salon*, a committee room, library, restaurant, business office and culinary department.

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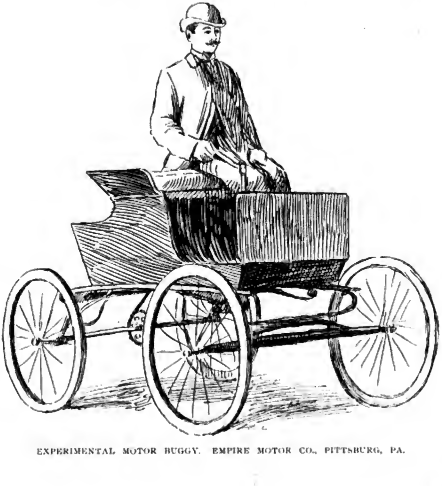
The Roger American Horseless Carriage Company, 33 Wall Street, New York, have entered two vehicles in the *Cosmopolitan* race, an improved Roger carriage, and another on an entirely new design, which is expected to be a prize winner



EXPERIMENTAL MOTOR BUGGY. EMPIRE MOTOR CO., PITTSBURG, PA.

The Peugeot Road Motor.

(From London *Engineering*.)

We publish complete details of a standard type of Peugeot road-car, from which it will be seen (Figs. 8, 9) that the frame carrying the whole of the mechanism, including the motor, the differential gearing, etc., is hung upon the axles by elastic plate springs; the length of the springs over the rear axle is about 40 inches; the forward springs are attached to the fore-body (Fig. 10). All of the springs are allowed sufficient play to become horizontal; the details of suspension are clearly shown in Figs. 9, 10. Between the forward and rear axles there is a distance of 62.60 inches, whilst transversely the width between the centres of the wheels is about 47 inches. Some of the earlier carriages were constructed with the forward wheels closer together than the rear wheels, but this method has been abandoned. It should be mentioned here that the wheels are all constructed in tension—modified bicycle wheels, in short—and that the outside of the rim is grooved to receive a strong and solid tire of vulcanized rubber. The spokes, which are of steel wire, from 20 to 24 inches in diameter, can be easily kept stretched, or they may be removed with but little trouble, so that they can be replaced quickly in case of accident. This construction has given excellent results in practice, and some of the tires have a record of 7,500 miles. Pneumatic tires have been used upon these wheels with excellent results as regards easy running, and they indicate an increase of 5 per cent. in speed, but they are not recommended by the makers, on account of the danger from rupture. At each end of the rear axle is brazed a box containing the hard steel balls that form the bearings for the wheels; to the boss of each wheel is attached a toothed ring that receives pitched chain *Ch*, Fig. 8, which transmits the movement of the countershaft; on this latter are keyed two toothed wheels marked P, P^1, and it is driven by the motor through a transmission and clutch E shown on the drawings. The driving chain adopted is of a particular form, manufactured by Messrs. Peugeot for cycle work; in order to maintain it in tension a chain-stretching device is introduced on each side of the carriage. A few words may be said here about the arrangement of the fore carriage and the means adopted for steering the vehicle. The gear consists of a hollow vertical rod T, on the top of which a steering bar is placed; this rod, which is clearly shown in all the illustrations, carries the signaling horn, with which all road motors in Paris have to be supplied. At the bottom of the vertical shaft T is placed a toothed wheel actuating a pitched chain which is shown by a dotted line in the plan, Fig 9; this chain transmits movements to a second toothed wheel that is mounted horizontally on the forward part of the carriage and which is also clearly shown on the drawings. Sometimes in the brakes and omnibuses constructed by these manufacturers, instead of a chain, an intermediate toothed wheel is introduced Figs. 8 and 9 show this arrangement quite clearly, but the forward carriage illustrated has also another peculiarity which will be understood by reference to the diagram Fig. 10, an elevation of the fore carriage. The suspension is so arranged that the frame always remains horizontal, in spite of concussions due to a bad road, or if one wheel passes over an obstacle or buries itself in a rut. The front of the carriage is supported by a single spring attached in the centre to the tubular frame by means of a trunnion, the ends of the spring being connected to the axle by two small cranks. By this arrangement the axle oscillates around the trunnion when movements are induced by an uneven road or from the oscillations due to the bending of the spring; in both of these movements it is guided by two slides, shown in the diagram Fig. 10. The arrangement is very ingenious, and appears to answer well; it is, however, necessarily somewhat complicated, and we believe that Messrs. Peugeot often adopt the Jeantaud fore carriage, which we have already described (see *Engineering*, Vol. lx., page 502). Among the several vehicles which were exhibited at Paris during the last cycle show, and some of which we illustrated in our last number, it will be seen that this simple form of fore carriages has been introduced. The conductor of the carriage is placed on the right-hand side of the rear seat, where he has close to his hand not only the steering lever T, but also the brake lever *F r*, the reversing lever *P o*, the lever for changing the speed *M*, and the pedal *Pe*, which is used for throwing the motor out of gear.

We have already said that the motor employed up to the present, for the Peugeot carriages is that of Daimler. Messrs. Peugeot, however, have recently patented a new type of motor, which has not yet been manufactured, and cannot, therefore, be described. In principle the Daimler motor comprises a system of sweeping out the cylinder, by air, admitted through valves placed in the pistons, but this arrangement has not been employed in the motors mounted on the Peugeot carriages.

One of the most interesting details of the Daimler motor is the carburetor in which the gasolene employed is converted into the explosive mixture; two types of the Daimler carburetor are in use, and they are both illustrated by Figs. 11 and 12, the former representing the earlier pattern. Its component parts are: A receiving cylinder, a float, a level indicator, an axial tube for charging the cylinder with gasolene, openings for the entrance of air and the discharge of the carbureted mixture, a regulating valve, and a metal cage or filter of wire gauze. The section, Fig. 11, shows all these various parts very clearly. The carbureting chamber is filled at the same time as the reservoir of the lamps, by a rubber tube coming from the main supply, as indicated by the arrows on the section, the overflow from the lamps passing into the carburetor. The mode of operation is very simple; the aspiration of the motor, which in the first place is started by hand, by means of a crank placed at the back of the smaller vehicles and in the front of such carriages as brakes and omnibuses, induces a flow of air into the upper section of the carburetor, which then passes through openings in an inner cylinder covered with fine wire gauze and enters the central tube which is supported by the float; from the lower end of this tube the air passes through small openings which are always kept bathed in the oil, and thus it becomes carburized. The air then rises, following the course indicated in the section by the arrows, and enters the upper part of the carburetor near the bottom, whence it enters a pipe leading to the distributing chamber of the motor. On this pipe is placed a regulating admission valve by which non-carbureted air can be added to the mixture; it is a three-way valve, so arranged that the amount of carbureted air is increased when that of non-carburated and cold air is diminished, and *vice versa*. It should be explained that the air before it is admitted to the carburetor is heated by means of burners placed beneath the pipe that leads the air to the carburetor; the arrangement of these burners is not shown on the section, but it is of a very simple character; the exhaust from the motor is not utilized at all for this purpose. It does not appear to be absolutely necessary to heat

Fig. 8

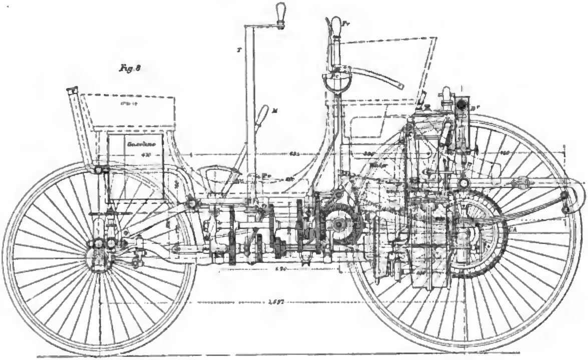
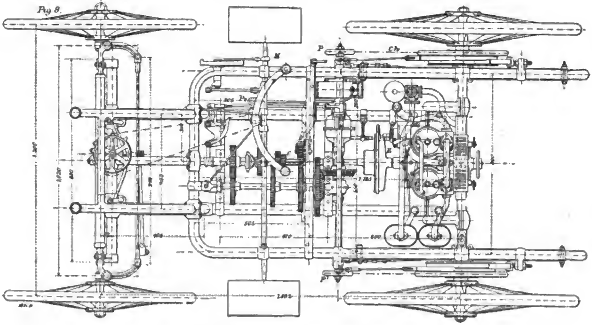
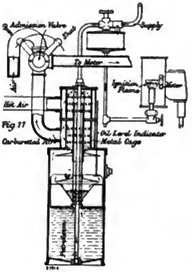
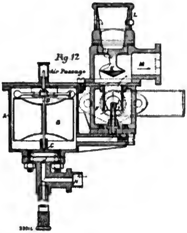


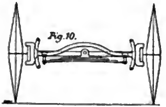
Fig. 8.

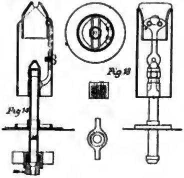


ELEVATION AND PLAN OF PEUGEOT MOTOR CARRIAGE.





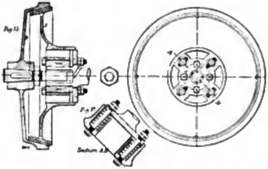




the air, especially in Summer, although considerable advantage is gained by doing so. The manipulation of the regulating valve is under the charge of the driver by means of a transmission of levers and a micrometric screw gear. This system, it is stated, presents several disadvantages: the level of oil in the carburetor is constantly varying, and there are no means of filling it automatically; the gasolene is not used completely, as the reservoir is emptied, with the result that its density increases, the residues sometimes rising as high as 725, and this prevents the motor from working efficiently. Owing to this inconvenience, it is necessary to refill the chamber before it is empty, and frequently to draw off the oil remaining in the bottom of the receiver. This type of motor is still largely employed with the Daimler motor, but for more than a year the Peugeot Company has adopted another form which is illustrated by Fig. 13; its arrangement is much more simple, and, once in action, it does not require regulating while the carriage is running. The gasolene from the main reservoir enters the receiver at *N*, flows through the metal gauze filter *O* to the small opening *C*; it fills the receiver *A* until the float *B* rises and closes the opening *C* by acting on the levers *E* that lower the spindle *D* which acts as a valve. At this moment the level of the oil ought to be a little above the adjusting device *I*, in order to prevent any overflow into the air chamber *F*. When the motor has been started by hand, the gasolene, agitated by the induced current set up, is projected through the narrow passage in the stem *I* against the button *K*, where it is vaporized by the air current; the carburated mixture then passes into the cylinders of the motor by the passage *M*. The flow of the spirit is regulated automatically by the float; the quantity of air heated by the burners and flowing through *G* is controlled by means of a sleeve forming a valve. It is easy to regulate the mixture according to the quality of the spirit employed by means of the valve to which the stud *K* is attached; this allows more or less cold air to enter according to the direction in which it is turned. At starting the cold air supply is entirely cut off, and if the first explosion does not take place, it can be easily caused by heating the chamber *F*; this is usually done with an asbestos torch steeped in the spirit. Experience has shown that this arrangement is reliable, and if kept properly cleaned, gives no trouble; at the same time it is very simple in operation and construction. The successive explosions in the motor are effected by a series of platinum points kept in a state of incandescence by means of burners (see Fig. 11), of which there are two types in use. The first is a Bunsen burner, the details of which are shown in Fig. 13. The gasolene is supplied to a reservoir placed against the back of the rear seat and about 12 inches above the burners; a wick placed in the tube *M* serves as a burner; it may be of cotton, asbestos, or even of wire gauze. The spirit rises by capillary attraction through the small hole at the bottom of the central tube, and is mixed with the required amount of air before reaching the burner, which is of elongated form; this is necessary in order to heat the igniting device along its whole length. In order to ensure a constant volatilization of the spirit, so that there should be no smoke, which would prevent the proper heating of the igniting tube, it is necessary before starting to heat the burners by means of the asbestos torch before alluded to. In the other type of burner, the Longuemar, the gasolene is delivered under pressure; it is shown in Fig. 14. In this burner the heat obtained is greater, and the carburization is effected somewhat more quickly, resulting in greater efficiency and economy; on the other hand, it appears that the arrangement is not without a certain amount of danger. The gasolene is fed through a capillary tube placed within another tube previously heated to a high temperature; in its passage through the inner tube the spirit volatilizes and burns at the top of the tube with a very hot flame.

The movement of the motor is transmitted to the wheels by a system of gearing which is illustrated in Figs. 8 and 9, the plan and elevation of the carriage; connection between the motor and the transmission is effected by means of a friction clutch, so arranged that the degree of pressure exerted can be graduated; this clutch is shown at *E*, and in detail by Figs. 15

to 17. The hollow coned plate *B* is keyed on the motor shaft, and turns with it; the other disc *A* is made fast on the main transmission shaft by four keys *C*, which force it on to the conical portion, while at the same time leaving it free to slide to the end of the shaft. When the shaft is turned the displacement acts on four coiled springs, Fig. 17, those placed opposite each other being more compressed than the others, which ensures a softness in action and a more regular progression in increasing or reducing the pressure between the two plates. Both are of cast iron and the face of the plate *A* is covered with leather, and is provided with holes, to allow of the escape of air when it is forced against the plate *B*. It will be seen that the motor shaft is extended beyond *B*, and when the clutch is thrown out of gear the shaft is supported in the centre of *A*. It should be added that the end of the transmission shaft is acted on by a coiled spring which holds the clutch plates in close contact when they are thrown in gear. Normally the plates of the clutch are in contact, but they can be thrown clear of each other by a depression of the pedal at the foot of the driver.



We may now pass on to consider the manner in which the motion of the motor is transmitted to the wheel of the carriage. At the commencement of their experiments, MM. Peugeot objected to the use of toothed gearing as a means of transmission, but sought to arrive at a good result by the use of friction or belt transmission; by such means they considered they would be able to have greater control in altering the rates of speed, and at the same time be able to stop and start more gradually. A very short experience, however, showed that the idea was not practical; the wear of the moving parts was very rapid, due to unavoidable heating, and there was an excessive loss of power; the makers, therefore, quickly resorted to toothed gearing throughout, except for the friction clutch already described. MM. Peugeot also wished an arrangement by which four different speeds could be assured, while the motor was kept running at an invariable rate; such a result was, of course, out of the question with belting used for transmission. As actually constructed, the Peugeot carriages are intended, when fully loaded, to give, on a road in good condition, a speed of four miles per hour on gradients of 8 to 10 per cent., and from 12 to 14 miles per hour on the level, but there are besides two intermediate speeds; this large range of control involves a certain amount of complication on account of the double series of gearing which is placed beneath the floor of the vehicle; the arrangement, however, is satisfactory, because it permits of the motor being always worked under the most economical conditions. It is claimed that with the larger range of speed at the disposal of the driver it is possible to travel up 10 per cent. grades with greater ease than can be accomplished with vehicles provided less well in this respect. The transmission shaft that receives its movement from the motor by means of the clutch is square, and a keyway is cut on it by which the four pinions, Figs. 8 and 9, each representing a different speed, are secured in the order of their diameters; different rates are provided by this means, of which one corresponds to the speeds one and two, and the other to speeds three and four; the width of the wheels is the same in each case, in order that there may be no variation in the traverse of the wheels on the shaft in changing from one speed to another. The wheels are shifted by a forked lever *M* operated from the driver's seat. On the second transmission shaft are mounted the next series of grooved wheels; these are of bronze, and are fast on the shaft, being screwed thereon by a threaded boss and afterward brazed. As will be seen from the plan, at the end of the intermediate shaft is a bevel pinion gearing into the bevel wheel on the chain shaft. The lever which regulates the speed works on a quadrant with five notches, one of which corresponds to the dead point, and the other four, each to one of the four speeds. The ratios of the changing wheels are two-ninths for the lowest speed, and four-fifths, or sometimes more, for the highest. The manner of driving the carriage will now be easily understood. When it is desired to start, the lever *M* is thrown over to the dead point in such a way that the square shaft carrying the pinions is free; then the various burners are ignited in the manner already described, and several turns are given to the crank so as to start the motor. The driver then depresses the pedal *Pe*, which is connected by means of a series of levers with the main shaft; this movement throws the clutch out of gear. He next sets the regulating lever into the notch corresponding to the lowest speed; by this the corresponding wheels on the first and second shafts are put in gear, that is to say, those two developing the least speed—about five miles an hour. He then raises his foot, releasing the first shaft, which is forced forward by the coiled spring at the end, and the clutch is thrown into gear. When this has been done, the motor starts the carriage at its lowest rate. If it is desired, when running, to increase the rate, the driver throws the clutch shaft out of gear before placing the regulating lever in another notch corresponding to the change. For reducing speed the operation is reversed, being always preceded by releasing the clutch, the separation, however, being too brief to permit of the carriage slowing down. When it is desired to stop, the pedal movement is repeated, but the lever is depressed until it strikes a stud connected with a brake on the chain chaft, as is shown on the plan, Fig. 9. For a temporary stop it is sufficient to place the starting lever at the dead point, but if the stop be one of long duration, it is necessary to close the valve on the pipe admitting the gas to the motor and to extinguish the burners. Besides the brake on the chain driving shaft before alluded to, there are two strap brakes acting on the centres of the rear wheels; these are thrown on by the action of the same lever that disengages the clutch, the lever marked *Fr* in the illustrations. An advantage possessed by the Peugeot system is that the motion can be reversed and the carriage run backward; the facility for doing this is applicable to the lowest speed only. To put it in operation the lever *M* is set to a stop between the first and second speed notches, and the handle *P O* is drawn forward; this throws in gear an independent toothed wheel mounted on a bracket, as will be seen from the plan, Fig. 9. As soon as this wheel is in gear with the pinions on the first and second shaft, the pedal can be raised and the connection with the motor made by means of the clutch.

From the foregoing somewhat extended description it will be be seen that much skill and ingenuity have been expended in the design of the Peugeot power carriage for road traffic; the numerous illustrations we have given of the vehicles, show that they have learnt how to combine elegance of appearance with suitability of purpose, and that in no case do the vehicles look as if they were ordinary carriages adapted for a novel use. Our illustrations show only a small number of the types manufactured by the firm, and which include many kinds, from the light carriage with two seats, weighing 750 pounds, 84 inches long and 52 inches wide, and able to carry 220 pounds, to the heavy omnibus weighing a ton, carrying the same amount, and measuring 9 feet by 56 inches. The illustration, Fig. 18, on page 307, shows one of the latest type; it is built for the delivery of goods to customers from one of the large Paris houses. We are informed by M. Armand Peugeot that the cost of petroleum per kilometre for a vehicle of average weight and capacity, is 4 or 5 centimes, and that the cost of maintenance, including the renewal of the rubber tires, is about 4 centimes.

PEUGEOT DELIVERY WAGON.

National Electrical Exposition.

A national electrical exposition will be opened May 4, at the Grand Central Palace, Lexington Avenue and Forty-third Street, New York. It will be held under the auspices of and in connection with the nineteenth convention of the National Electric Light Association.

Arrangements have been made to convey Governor Morton from Grand Central Station to the exposition in an electric wagon, probably one of Morris & Salom's "Electrobats."

The exposition will continue until May 31.

Paris Race Postponed.

The committee of the Automobile Club has decided to postpone the Paris-Marseilles-Paris race until the 1st of October, in order to allow more time for preparation.

Regulations for the Cosmopolitan Motor Carriage Contest, May 30, 1896.

I.—JUDGES.

Gen. Nelson A. Miles, U. S. Army; Brig.-Gen. Wm. P. Craighill, Chief of Engineers, U. S. A.; H. Walter Webb, Vice-President New York Central Railway, John Jacob Astor, Esq.

II.—ROUTE.

The route will be from the New York office of the *Cosmopolitan* magazine, on City Hall Park, to the *Cosmopolitan* Building at Irvington and return.

III.—ENTRIES.

All carriages must be entered at the New York office of the *Cosmopolitan* not later than 9 o'clock on the morning of the 30th of May.

IV.—START AND POSITION.

Carriages must be in City Hall Park, ready to take the position assigned by the marshal, not later than 9.30 a. m. Those who have made entries on or before 6 p. m. of May 28 will be assigned numbers by lot, which numbers will indicate position in line.

V.—DISCRETION OF JUDGES.

First: The judges shall have power, should the weather be unusually severe, to postpone the contest to the following day.

Second: The prize or prizes shall be awarded at the will of the judges.

Third: The judges shall have power to determine what for the purposes of this contest shall constitute a horseless carriage, and exclude from the contest any vehicle which does not seem to come properly under that term.

VI.—NUMBER OF PASSENGERS.

Each carriage must carry at least one passenger in addition to the driver. This passenger may be selected by the judges.

VII.—ROUTE, SPEED AND STOPS.

First: The horseless carriages shall move from City Hall Park as soon after 9.30 a. m. as the order shall be given by the judges.

Second: They shall take position according to number, those entering after numbers have been allotted being assigned at the rear of the procession by the marshal.

Third: The procession shall move up Broadway to Twenty-third Street, and thence along Fifth Avenue to the Fifty-ninth Street entrance to Central Park, at the rate of 2½ miles per hour.

Fourth: At the entrance to the Park the contest for speed will be begun and continued through the Park over the route indicated to Lenox Avenue, and thence through 125th Street to Washington Bridge, where carriages will be timed and stopped. Upon the arrival of the judges they will again be started, following the route along the country roadway through Riverdale, Yonkers, Hastings, Dobbs Ferry, to the Ardsley Country Club, at Irvington.

Fifth: The judges will take a special car at Washington Bridge, extended by courtesy of Vice-President Webb, and proceed by the Hudson River Railway to the Ardsley Country Club at Irvington.

IX.—TIMING.

As the carriages pass the gates of the Park they will be timed again at Washington Bridge and again at the Country

Club. Upon their return trip they will be timed at the Fifty-ninth Street entrance of the Park, and from that point they will proceed at 2½ miles per hour to the New York office of the *Cosmopolitan* magazine.

X.—INSPECTION.

When the carriages have reached the Country Club at Irvington they will be inspected and tested under the direction of the judges.

About thirty-five entries are so far reported.

Foreign Notes.

The postal service of the Island of Ceylon is to be performed by motor wagons.

The amount subscribed for the Paris-Marseilles race already exceeds 40,000 francs, of which James Gordon Bennett gives 10,000.

An automobile club, modeled after that of Paris, and entirely non-commercial in its object, will be organized in London.

The Compagnie Generale des Omnibus de Paris has ordered 16 Serpollet steam omnibuses, which will be put into service on its lines.

M. J. Brown, of Belfast, Ireland, has purchased a Serpollet steam vehicle, the first motor vehicle that has been seen in the Emerald Isle.

A writer in a recent issue of the *Journal des Industriels*, published at Paris, tells us that, thanks to the visit of M. Roger to these shores last Summer, 25 motor delivery wagons are now to be seen daily in the streets of New York. Would this were true!

◆

Wm. Morgan, manager of the Empire Motor Company, Pittsburg, Pa., states that he is now engaged upon a new, double-cylinder horizontal motor, with only one working valve on each cylinder, both being controlled by one eccentric, which shifts automatically from one cylinder to the other on a track. This valve motion also controls the spark, and no gear wheels are used.

Join The American Motor League.

______________________ *189*

American Motor League,
335 Dearborn Street, Chicago.

I hereby make application for membership in **The American Motor League**, and I agree to comply with the Constitution, By-Laws and Rules. I enclose Two Dollars for initiation fee and One Dollar for annual dues.

Name ______________________

Street ______________________

Town ______________ *State* ______

Cut this out and send it to the Secretary, Dr. J. Allen Hornsby, 335 Dearborn Street, Chicago, Ill.

Minor Mention.

W. S. Eaton, S. Hampton, N. H., is building a vehicle which he hopes to enter in the *Cosmopolitan* contest.

The American Motor League will arrange for a meeting and dinner in New York at the time of the *Cosmopolitan* contest.

Arthur W. White, of London, Ont., who was one of the umpires in the *Times-Herald* contest has been selected to serve in the same capacity in the *Cosmopolitan* race.

The '95 Duryea wagon, which won the Chicago contest last Fall, was exhibited at the Detroit Horse Show last week. Charles B. King, treasurer of the American Motor League, acted as "chauffeur," as the French say.

Edward Blum, of Anderson, Ind., has completed a bicycle motor which be states weighs 12½ pounds to the horse-power. He is thinking of coupling two bicycles together and entering the *Cosmopolitan* race with this improvised vehicle.

W. W. Mackay, Steubenville, O., publisher of the *Evening and Weekly Star*, is about to open a store in that city, where be will sell everything on wheels. He is much interested in motor vehicles, and would like to secure an agency from some manufacturer.

Geo. Leaman, secretary of the Red Star Steam Laundry, San José, Cal., writes that they frequently have to deliver goods 20 miles out in the country, and as the roads in that section are excellent, he is desirous of purchasing a motor delivery wagon.

Wood & Meagher, mechanical engineers, of Richmond, Va., are building a motor carriage which they will enter in the *Cosmopolitan* and Paris races. The motive power is said to be something radically new, the nature of which the inventors are not prepared to divulge.

Harry E. Dey has made arrangements to build an electric carriage on the system described in the November issue of The Horseless Age. The source of power will be the "Dey High Potential Storage Battery," while speed will be controlled by the liquid gear invented by Mr. Dey.

The Ball-Bearing Company, of Boston, Mass., will have an exhibit of their ball-bearing axles and machine ball-bearings, at the National Electrical Exposition, to be held at the Industrial Building, Lexington Avenue and Forty-third Street, New York, May 4 to 21, inclusive. The exhibit will be in charge o their mechanical expert, James A Morton.

C. R. Alsop, of Middletown, Conn., is building a 12-hp gasolene launch motor, which weighs only 325 pounds, fly-wheel included. It has two cylinders, placed athwart the boat, and is of the two-cycle type, giving an explosion in each cylinder every revolution. Mr. Alsop believes there is no limit to the size of the engine he can build on this principle.

Two Duryea motor wagons have been on exhibition in New York during the month of April. One of them was a leading attraction of Barnum & Bailey's "Greatest Show on Earth," which opened at Madison Square Garden on April 3, and the other which arrived about the 15th is making headquarters with the Rubber Tire Wheel Co., 1784 Broadway.

Flandran & Co., carriage builders, of Broome Street, New York, are doing the carriage work for Wallace Grant, of Brooklyn, who has entered a motor carriage in the *Cosmopolitan* race. Mr. Grant is the inventor of the motor, which is being constructed by the E. W. Bliss Co., Brooklyn, N. Y. The carriage has one seat, and is driven by an 8-hp gasolene motor.

The Roger motor carriage, owned by the Mechanical Carriage Company, of New York, which, during the past Winter has been undergoing alterations at Bridgeport, Conn., has been rented by the advertising manager of Keith's Theatre. New York, and is now seen daily in the streets and boulevards, covered with placards setting forth the attractions of this place of amusement.

Chas. H. Barrows, Willimantic, Conn., writes that he is not ready to illustrate his vehicle yet, as it is still in a crude state. He adds that past experience has taught him that if the matter should be published now in The Horseless Age he would be "flooded with letters from all over this country and half the world besides." He wishes to save our readers the trouble of correspondence until he is ready for business, which will be soon.

The Eastern Carriage Motor Company, New Haven, Conn., are constructing at the shop of the Hoggson & Pettis Manufacturing Company a motor trap, which will soon be shown upon the streets of the Elm City. It is intended to carry four persons, has a seven-hp motor, and, contrary to the prevailing tendency, is built so high that two steps are required to ascend to the seats. H. W. Clapp, formerly of Springfield, Mass., is the promoter of the new company.

The Duryea-King motor, manufactured by Charles B. King, 112 St. Antoine Street, Detroit, Mich., has been successfully applied to a motor vehicle built by the Emerson & Fisher Co., of Cincinnati, O. The vehicle was delivered to a circus that started on the road about the 15th of April, and will be exhibited through the country. The Emerson & Fisher Co. have other vehicles under construction, and expect to use a large number of the Dunyea-King motors before the season is over.

John Jacob Astor has given a boat builder of Nyack, N. Y., an order for a 72-foot electric auxiliary launch, which will be by all odds the finest electric boat ever built in America. She will be fitted with twin screws, which will be run by two electric motors, developing 50 horse-power. The maximum speed is to be 16 miles an hour at 1,000 revolutions a minute, and her storage batteries consisting of 480 cells will run 10 hours without recharging. Both batteries and motors will be placed below the deck. Electricity will perform about everything necessary to be done on a boat of this size and type.

SPECIAL NOTICES.

Advertisements inserted under this heading at $2.00 an inch for each issue, payable in advance

R. L. MARTIN, Weir Park, Florida, wants a motor car for ordinary roads, with cooking and sleeping accommodations for eight people Designs, etc , will reach him addressed as above.

WANTED.—A two horse-power oil motor, to run portable elevator; one without water jacket preferred; simplicity of construction desired. Address Shadbolt Mfg. Co., 68 Flushing Avenue, Brooklyn, N. Y.

DAIMLER MOTORS.

FOR LAUNCHES.

Triple, Twin, and
Single Screws.
Paddle and
Stern Wheels
of lightest draft.

For Stationary Purposes,

SUCH AS
Hoisting, Pumping,
Electric Lighting, and
Driving all sorts of
Machinery,
ON LAND OR WATER.

NO LICENSED ENGINEER, PILOT, OR GOVERNMENT INSPECTION REQUIRED.

The Daimler Motor is the most powerful and compact, as well as reliable engine now on the market.

THE DAIMLER MOTOR CARRIAGES

Were awarded the following Prizes:

1. Grand Prize 5,000 Francs, at Paris, July, 1894.
2. Gold Medal and First Prize at Turin, May, 1895.
3. First Prize of 40,000 Francs, as well as the Second, Third, and Fourth Prize, at Paris, June, 1895.

DAIMLER MOTOR CO., - Steinway, Long Island City, N. Y.

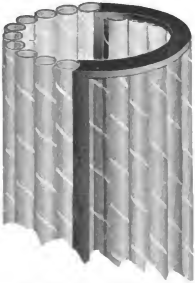
Pneumatic, Cushion and Solid Rubber Tires

FOR WOOD WHEELS.

The best in the world and **Guaranteed.** All sizes applied to new or old wheels. We supply the leading manufacturers of horseless carriages. Send for catalogue.

American Rubber and Columbia Pneumatic } Rubber Tire Co.

247-251 Phelps St., ONEIDA, N. Y. 131 W. 38th St. (Cor. Broadway and 38th St.), NEW YORK.



The Hyatt Roller Bearing.

The Greatest Friction Saver of the Age.

SAVES POWER. **SAVES FUEL.** **SAVES WEAR.** **SAVES OIL.**

For Motor Vehicles and Machinery in General.

THE Hyatt Bearings are both flexible and elastic, hence there is no binding and friction is minimized. They are made of mild steel, and are not hardened and tempered, hence there is no tendency to crystallization or breaking under the load. This bearing is recommended for all high speed machinery, either for light or heavy loads.

Write for particulars and results of tests to

Hyatt Roller Bearing Co.,

450 MARKET ST., NEWARK, N. J.

Unlimited English Demand for Motor Cars and Motor Cycles.

England Has Not Begun to Manufacture.

American Inventors and Manufacturers of

MOTORS, MOTOR CARS

—AND—

MOTOR CYCLES

Wishing to sell their productions

IN ENGLAND

Or to deal with English Rights should

Exhibit (free of charge) at International Exhibition, Imperial Institute, London. The Attraction of the London Season.

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Place (without charge) their names and description of productions in Motor Car Club Register of Motors and Motor Cars. 3,000 capitalists and buyers on books.

Apply Hon. Secretary Motor Car Club,
40 Holborn Viaduct, London.

Atwood Mfg. Co.

Amesbury, Mass.

(The largest manufacturers of Vehicle Lamps in the world.)

We make Lamps for every kind of a vehicle. The Atwood Driving Lamp makes a nice Lamp for a Horseless Carriage. Write us telling what you want, and we can please you if any one can, we have such a variety to select from.

Send for catalogue, mentioning this publication.

$5,000

In Guaranteed Prizes.

The management of the RHODE ISLAND STATE FAIR ASSOCIATION, Providence, R. I., have decided to offer the above amount in prizes to the successful competitors in a motor carriage race and exhibition to take place beginning September 7th, and continuing for five days, at Narragansett Park, Providence, where the most successful fair of the New England section is annually held.

Full details and regulations of the contest will be announced soon.

R. I. State Fair Association,

33 India Street,

PROVIDENCE, R. I.

Duryea Motor Wagon Company,

SPRINGFIELD, MASS.

MANUFACTURERS OF

Motor Wagons, Motors, and

Automobile Vehicles of all kinds.

"1896 MODEL"

TRADE THE "HUB" MARK. ANTI-FRICTION BALL-BEARINGS

NO WEAR. NO CARE. NO ADJUSTMENT. NOISELESS. EASILY APPLIED.

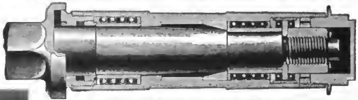
For Motor Vehicle and General Machine Construction.

Enormous Saving in Friction and Power Transmission.

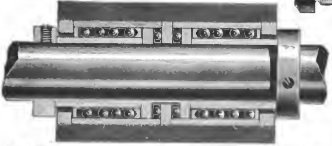
No wear on either Shaft or Box. Balls have *lateral traverse*, and roll only upon hardened steel *removable* surfaces.

For Light and Heavy Vehicles.

Sizes, ¾, 1, 1⅛, 1¼, 1⅜ and 1½ inches. Larger sizes in process.



Patented Aug. 19, 1890; April 7, 1891; Jan. 5, 1892; and July 11, 1893.



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(For heavy loads and hard service—takes the **Thrust in either direction.**)

CAUTION:—Infringement of Patents will be vigorously prosecuted.

The only Ball-Bearing on the market supporting the following claims:

1.—A SUFFICIENT NUMBER OF BALLS to properly carry heavy loads.
2.—SEPARATE SETS OF BALLS to take the load and the "end thrust."
3.—The balls CONFINED IN CAGES, enabling them to be handled as ONE PIECE.
4.—Requiring ABSOLUTELY NO ADJUSTMENT.

Descriptive circular with full information **mailed free** upon receipt of address. Correspondence solicited.

THE BALL-BEARING COMPANY,

Main Office, The Hancock Inspirator Co.'s Building,
Watson St., near Northampton, BOSTON, MASS.

THE HORSELESS AGE.

A MONTHLY JOURNAL

DEVOTED TO MOTOR INTERESTS.

VOL. I. NEW YORK, MAY, 1896. No. 7.

THE HORSELESS AGE.

E. P. INGERSOLL, Editor and Proprietor.

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ADVERTISEMENTS.—Rates will be made known on application. When change of copy is desired it should be sent in not later than the fifteenth of the month.

COMMUNICATIONS.—The Editor will be pleased to receive communications on trade topics from any authentic source. The correspondent's name should in all cases be given as an evidence of good faith, but will not be published if specially requested.

THE HORSELESS AGE will be sent regularly to advertisers, paid subscribers, and exchanges only.

Address all correspondence, and make all checks, drafts, and money orders payable to

THE HORSELESS AGE, 216-218 William Street, New York.

Entered at the New York Post Office as second-class matter.

The Cosmopolitan Race.

AN examination of the lists of the real and probable entries for the *Cosmopolitan* race and a comparison of the total with the actual starters will afford an instructive example of the uncertainties of experimental mechanical work. The total, both real and probable, foots up about 30, but from the best sources of information at the editor's command no more than a dozen vehicles may be expected to start, and quite possibly a smaller number. One contestant expects to enter five or six vehicles, two or three are doubtful, hoping—rather against hope—to be able to appear on the appointed day, but the majority realized some time ago that it would be impossible for them to complete their tasks. A motor vehicle cannot be built in three months and give a satisfactory performance, nor yet in six months. The adjustment of the whole and the replacing of defective parts require more time than the most conservative estimate is willing to allow.

The number of starters may therefore prove a disappointment to some, but they will be sufficiently numerous to prove beyond cavil that progress has been made since the pace was first set at Chicago last Fall. The new vehicle will be introduced to the New York public, and an example will be set, which will undoubtedly redound to the benefit of the industry. Other races and exhibitions in New York will be more easily organized and more generously supported because of it.

The course of the race is a succession of hills, with an occasional "Thank you ma'am," to remind the too eager operator of the present unfavorable condition of American roads. High speed is therefore out of the question, and those who ignore the road in an effort to make it, may come to grief.

Still, there are compensating circumstances. The parade and the race will extend through a populous section, and even if the actual number who witness any part of the contest will be less than would witness it on a race track, thousands more will read of it with interest.

The round-up at the Ardsley Country Club will afford inventors an opportunity of exhibiting their vehicles before a large number of possible purchasers and investors, who will be assembled there with the double purpose of viewing the race and celebrating the opening of this magnificent club house.

Another cause for congratulation among motor enthusiasts is found in the action of the management of the International Permanent Exhibition Company, who offer their palatial building at Forty-third Street and Lexington Avenue, as a headquarters for the motor vehicles competing in the race, without charge, until June 13. The location is unsurpassed, and the officers of the exhibition, taking a deep interest in the advancement of the new art, will put forth every effort to make it both pleasant and profitable to those who take advantage of their liberal offer. The American Motor League will make its headquarters here during the race, and it is the desire of the managers of the exhibition that out of this temporary arrangement should grow a permanent exhibition of motor vehicles, for which the premises are in every way admirably fitted. The knowledge gained by those who avail themselves of the privileges of the building during the race, will doubtless lead to hearty co-operation with the plan of the management. New York needs a permanent motor exhibition, and the Grand Central Palace is the place for it. The brilliant success of the electrical show now going on there is a conspicuous proof of the advantages of its location and equipment, and the competence of the board of managers. Meantime the work of preparation for the Providence race is being vigorously pushed by inventors all over the country. Scores who could not complete their vehicles for the *Cosmopolitan* race have written the editor that they will have no difficulty in getting ready for the Eastern contest in September.

"Another race is run, and other palms are won."

To Prohibit the Use of Tractors.

The new bill now before Parliament, removing restriction from the use of motor vehicles on English roads is entirely satisfactory to the promotors of the new industry there with one exception. A clause has been inserted forbidding motors to be employed as tractors, or in other words, for the hauling of other vehicles, on the ground that the unusual length of such a combination would be dangerous to street traffic, particularly in rounding corners.

Strong influence has been brought to bear upon the framers of the act, and members of Parliament who have it under consideration to eliminate this restriction, which seems wholly unnecessary. The length of the motor vehicle must certainly be limited, and the number that could safely be coupled together must depend upon the speed at which they will run and the number of vehicles encountered on the road. For the present, one or two vehicles would probably be all that could safely be handled. To the farmer especially this method of making up wagon trains would be a boon, and the friends of the motor vehicle in England are presenting this fact clearly before the committees of Parliament.

Innovations of this character are of slow growth, and it is impossible to foresee all the lines of usefulness which the new vehicle will follow, but a sweeping restriction such as is contemplated in the new act hampers unnecessarily the development of a great industry. Long usage has established the laws of the road, and operators of traction motors will naturally use extra care for their own safety as well as that of others. Limitations as to speed and number of vehicles drawn, would be much more reasonable than to prohibit the use of tractors altogether.

Is the Motor Carriage a Traction Vehicle?

M. H. Daley and Dr. Hardman are not agreed as to whether the motor carriage is a traction vehicle or not, the doctor holding that it is and Mr. Daley that it is not. The question which must necessarily arise in the mind of the reader in perusing this discussion is, What is a traction vehicle? The first requisite in argumentative discussion is to define one's terms, and if Mr. Daley and Dr. Hardman will favor The Horseless Age with their respective definitions of what constitutes a traction vehicle they will oblige the editor, and will then be in a position to argue more conclusively. Many a discussion is due simply to a misunderstanding of terms.

FOREIGN NOTES.

The motor exhibition at Brussels has been postponed.

It is reported that Mr. Pennington's challenge to pit his motor vehicle against any other in the world for a purse of $5,000, has been taken up by the Belgian firm of Vincke & Delmer, who are exhibiting several vehicles at the Imperial Institute.

Tokio, Japan, boasts of the possession of one motor carriage, imported from Europe, of course.

The city fathers of Bombay, India, have decided not to purchase motor vehicles for the city departments just at present.

Among the entries in the Paris-Marseilles race are Clement & Co., Leon Febevre, Gauthier & Verlhe, M. Delahaye and the Daimler Motor Co., of London.

The Touring Club, of France, has established about 200 depots in the provinces for the sale of petroleum of the proper grade for motor use. It has also organized a school for the training of motormen, and expects to give certificates to about 30 men this season.

The Motor Car Club, of London, now numbers some 300 members.

Road Resistance.

BY M. H. DALEY.

In answering Dr. Hardman's criticism of my article in the March issue of the HORSELESS AGE, entitled "The Motor Carriage Not a Traction Vehicle," I will endeavor to make my meaning so plain that the general reader will understand the principles involved, for I consider the subject of prime importance and liable to misconstruction, as is evident from the criticism referred to.

Most people seem to think it takes considerable power to keep a load moving forward, while the fact is, when once in motion, a body will forever go forward until something stops it.

The question arises, what is it that prevents the carriage from going forward after set in motion? The answer is the resistance of the air and the road friction. I claim that the road friction is overcome by revolving the wheels to that extent that there is no friction between the carriage and the road. All that remains is the resistance of the air, and this no one claims can be overcome without the application of power to push back on the road an equal amount, but the air resistance is so slight that it would have very little tendency to slip the wheels on a muddy road.

A man standing in a wagon that is in motion would have as much tendency to slip as do the wheels of the motor carriage, yet it cannot be claimed that the man is carried forward by the traction of his feet as it is usually understood. The best illustration I can give would be to suspend a weight from the bottom of a common carriage, so that it will clear the ground. The carriage will now overcome road friction. On moving the carriage forward the cord is deflected from the perpendicular (a pointer held perpendicular will aid your observations). As soon as the carriage gets in motion and inertia is entirely overcome, the cord will be deflected less and will show the power required to overcome air resistance. If the wind is blowing the same rate of speed and in the same direction as the carriage and weight are traveling, the cord will indicate a perpendicular, showing that no power is required to keep the weight in motion.

This experiment can easily be tried by any one, proving that the principal resistance to forward motion is road resistance.

A careful study of this road resistance will show several factors which must be taken into consideration.

If the road is uneven or rough the power of gravity acts to press the wheels into every low place, and it requires power to lift the load as many foot pounds as the upward vibrations added, and this sum in feet multiplied by the weight of the carriage and its occupants.

The uneven road also moves the carriage to the right or left from a straight line and it requires power to do so. Of course there is some power saved and some forward thrust caused by the dropping of the wheels on the forward side of each high place, the same as going down hill.

When the road is soft there is a depression of the road-bed by the weight on the wheels, and power is required continually to depress that part of the track immediately in front of the wheels.

Where the road is muddy there is the addition of friction to the sides of the wheel, and the weight of mud added to the weight of the load to carry, as well as an amount of adhesion to the ground.

If the wheels have not the proper gather, that is, if the wheels do not roll straight ahead but draw a little sidewise, this adds to the road friction.

The smoother and harder the road surface the less road friction. The fewer the grades or hills the less will be the power required to overcome the road resistance.

The motor carriage, all wheels of which are driven, overcomes road resistance by revolving the wheels. The bottom of the wheel moving back with the ground overcomes the friction the same as ball-bearing. The balls rolling with each surface overcomed the friction of the bearing.

Good roads will make less power required, but no more so than with the horse vehicle. Our roads should be made better as a means of economy in transportation. The amount of lost energy that has been expended on bad roads can never be ascertained; even an estimate would be hard to make.

Let us understand that bad roads are no argument against the motor carriage. That the wheels do not slip in propelling the carriage but simply revolve to overcome road resistance; that there is no tendency to slip except in starting and very little then if the carriage startes slowly. Get these facts before the public and there will be less talk about motor carriages being impractical and only adapted to cities having paved streets.

The fact is, the motor carriage can propel itself, and has no limit to the amount of power that can be used for that purpose; that different kinds of power can be used in different locations to cheapen their use where fuel is cheap.

The motor carriage is only in its infancy. The method of propulsion is new, and the principles involved are little known. Heretofore power has been applied as traction. The horse, the ox and the engine have been used to *pull the load*. The locomotive pulls the cars by traction, and the first efforts were with cog-rack for tracks and cog-wheel drivers on the locomotive, which, however, soon gave place to the smooth track and heavy engines for traction.

I am satisfied that the motor vehicle for heavy loads must have all wheels driven, or else a pair of steering wheels attached to a pole, so they will not have to carry the load, but simply turn the front wheels of the vehicle.

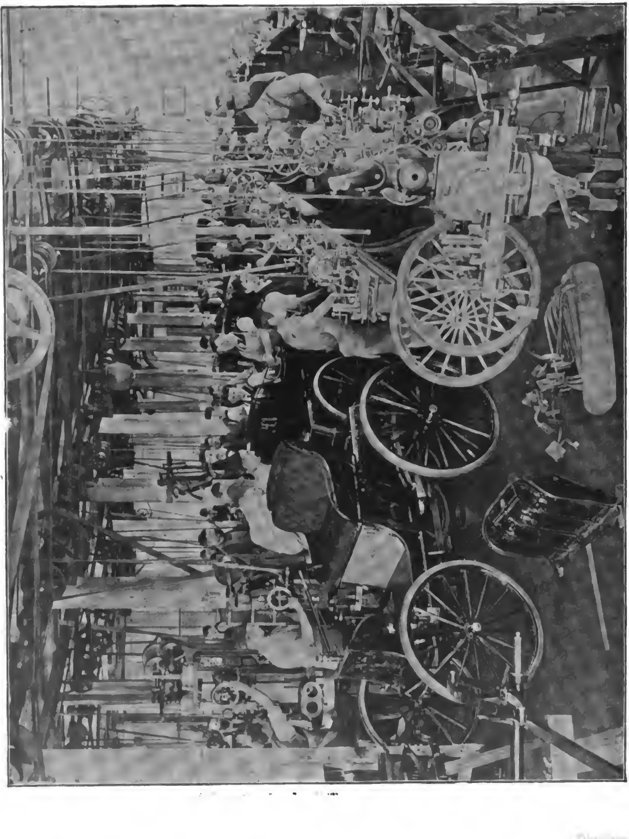
Pneumatic tires are a great help in overcoming road resistance. The body of the carriage is not so much deflected from a straight forward motion. The tire allows the uneven surface to dent its outline and gives back the power upon passing the obstruction and regaining its shape.

Large tires give more of this spring and allow more of the bottom of the wheel to conform to the uneven road, but I think, as there is more surface on the ground, there is more adhesion of the wheel to the road and considerable power is consumed in pulling the tire off the ground.

Practical experience will determine what kind of tires are best suited for the new vehicle, as well as what kind of wheels and motor. The survival of the fittest will here determine what form of vehicle is best suited for different kinds of work.

But this idea that good roads are absolutely necessary to the practical use of the motor carriage; that the wheels will slip in propelling them, is false. A motor carriage with sufficient power can climb any hill or grade on which the vehicle would stand if the wheels were tied and allow shaking. I understand that a wheel has less friction to hold it when it is vibrating, but it would be a pretty steep hillside on which a carriage would not stand even if you were to shake it.

The motor carriage must be practical for country roads and long distances; must be as strong or stronger than the horse carriage and as simple in construction.



GETTING READY FOR THE COSMOPOLITAN RACE AT THE DURYEA FACTORY, SPRINGFIELD, MASS.

The motor must be simple, strong, durable and not liable to get out of order.

The driving mechanism must give a variable speed, and the motor should run at a uniform speed, controlled by a governor that automatically regulates speed, otherwise every variation of power required would have to be attended to by the operator, and this would be a very annoying task.

If the speed is regulated by the motion of the foot and the steering by the hand, it will be similar to the bicycle and will be easily understood.

I should advise Dr. Hardman to try some experiments, such for example, as taking a barrel or wheel, getting in it and revolving it, squirrel cage fashion; then let him see if he can slip it on the ground.

The Horseless Carriage Co., Ltd.

The Horseless Carriage Company, Ltd., the English syndicate, organized about six months ago to investigate the motor field, acquire patents therein and engage in the manufacture of motor vehicles, is about to issue its prospectus.

The work of investigation has been most energetically carried on and many patents have been acquired, or working rights secured. These patents cover petroleum, steam and electricity, so that the field of the company will not be limited. The De Dion, Bouton & Co. patents relating to steam vehicles; the patents of M. Bollée on the petroleum tricycle, described elsewhere in this issue; working rights under the Daimler, the Bersey and the Garrard and Blumfield patents, the two last pertaining to the electric end of the business; and patents by Frederick R. Simms and H. J. Lawson already stand to the company's credit, and negotiations for the purchase of other desirable inventions are now pending.

The company will thus be able to build all classes of vehicles from the light tricycle to the street car, which it will be privileged to market not in the British Isles alone, but in all the English colonies and dependencies.

A suitable factory has been selected at Coventry, which is being fitted up with the most improved machinery, and vehicles in quantities will soon be turned out.

It is reported that the Horseless Carriage Company is negotiating for the Pennington patents.

News from Mexico.

Samuel W. Walker, an importer and commission merchant of Mexico City, and an interested reader of THE HORSELESS AGE, writes that the Mexican capital at present harbors one motor carriage only, a French vehicle imported for a prominent citizen.

He is of the opinion that a number of motor carriages could be sold there, if they could be sent on for inspection and trial.

There are no restrictive laws in Mexico to prevent the introduction of motor vehicles, and while the roads are not of the highest order, in some sections the motor could be successfully employed.

Mr. Walker expects to import some of the new vehicles in the near future.

"The Engineer" 1,100 Guinea Motor-Vehicle Competition.

CONDITIONS OF COMPETITION.

NOTE.—These are drawn up on the assumption that the present restrictive legislation will cease to be in force prior to the date of the competition, and that a new Act of Parliament will have been passed giving greater facilities. It may be, however, that this new Act will not allow of all the following conditions remaining exactly as now set forth, and they may possibly have, when the legislation is complete, to be modified. If, unfortunately, the state of the law should make it impossible, in the judgment of the proprietors of *The Engineer*, to hold the competion as at present contemplated, no blame or responsibility shall attach to them or the judges, or to the Crystal Palace Company.

The proprietors of *The Engineer* have agreed with the Crystal Palace Company, who have offered facilities at the Crystal Palace for showing the carriages in work there, and for holding the subsidiary trials hereafter referred to.

JUDGES.

The following are the names of the judges:

Sir Frederick Bramwell, Bart., F. R. S., M. Inst. C. E.

Mr. John Audley F. Aspinall, M. Inst. C. E., Chief Engineer to the Lancashire & Yorkshire Railway.

Dr. John Hopkinson. F. R. S., M. Inst. C. E.

The competition is to be International.

CLASSES.

The vehicles will be divided into four classes and one supplemental class, in each of which a prize will be given, as follows:

A.—For the best mechanically propelled vehicle constructed to carry, including the driver, four or more persons, the total weight, when fully loaded, not exceeding two tons, a prize of 350 guineas will be given.

B.—For the best mechanically propelled vehicle constructed to carry either one, two or three persons, the total weight, when fully loaded, not exceeding one ton, a prize of 250 guineas will be given.

C.—For the best mechanically propelled vehicle constructed to carry, in addition to the driver, not more than one ton of goods or parcels, the total weight, when fully loaded, not exceeding two tons, a prize of 250 guineas will be given.

D.—For the best mechanically propelled vehicle constructed to carry, in addition to the driver, five cwt. of goods or parcels, the weight, when fully loaded, not exceeding one ton, a prize of 150 guineas will be given.

SUPPLEMENTAL.—For the vehicle, whether for passengers or goods, propelled solely by a motor actuated by the vapor of oil or spirit having a lower specific gravity than 0.8, or a flashing point lower than 73 deg. Fahr., Abel's test, and constructed to satisfy the requirements of any Act of Parliament, and the rules to be made thereunder for the time being respectively in force, which, in the opinion of the judges, best satisfies the purpose for which it is built, a prize of 100 guineas will be given.

The judges are to have the power to divide any prize in case of vehicles proving of equal merit.

PROPELLING POWER.

Any method of propulsion other than muscular power may be employed, provided it be contained in the vehicle.

QUALITY OF OIL FOR POWER PURPOSES.

Except in the supplemental class, no oil or other liquid used in any engine, whether for the production of an explosive mixture, vapor, or for fuel, shall have a lower specific gravity than 0.8, or a lower flashing point than 73 deg. Fahr., Abel's test.

ENTRIES.

Entries are to be made on printed forms—to be obtained at the offices of *The Engineer*—at any time prior to 6 p. m. on the last day of July, 1896, being forwarded by registered letter, addressed to the editor of *The Engineer*, 33 Norfolk Street, Strand, W. C., and accompanied by a deposit of £1 for each entry; this deposit will be forfeited if the vehicle entered is not submitted tor competition.

DELIVERY.—DESCRIPTION AND DESCRIPTIVE DRAWING.

The competing vehicles must be delivered at the Crystal Palace, Sydenham, between the hours of 10 a. m. and 6 p. m. on some day prior to Oct. 2 next. Prior to the delivery of each of the vehicles, there must be forwarded to the editor of *The Engineer*, 33 Norfolk Street, Strand, W. C., a docket showing the weight of the unloaded vehicle, in complete running order, with its store of fuel and water—if these are to be used—this docket being furnished by a weigh-master of some public weighing machine. At the same time there must be forwarded six, at least, type-written or printed descriptions of the machines, setting out, as briefly as possible, any peculiarities of construction or of working to which the competitors desire to draw the attention of the judges, and also six sets of clear blue-print drawings or sketch tracings, to a scale of not less than 1½ inches to the foot, illustrating the construction. These documents will not be returned, but on their receipt, a printed form of request to the Crystal Palace Company, to accept delivery of the vehicle, will be forwarded to each competitor by the editor of *The Engineer*, and this form of request will have to be produced to the authorities at Sydenham when the vehicle is delivered.

OPENING UP OF MACHINES.

After delivery, and before the practical working run, hereinafter referred to, each vehicle is to be opened up by a skilled attendant representing the competitor, in the presence of one or more of the judges, or their representative, for their information.

PRELIMINARY RUNS.

Preliminary runs in the grounds of the Crystal Palace will be made with each of the vehicles in succession by the competitors in the presence of the judges or of some one representing them.

PRACTICAL WORKING RUN.

This will consist of a run on the public roads of not less than 100 miles out and 100 miles home, or a total of not less than 200 miles, over a course to be announced three days prior to that fixed for the run. It is impossible at present to fix the exact date for this run, but it will probably be arranged for Monday, the 12th day of October next. On starting for this run from the Crystal Palace, each vehicle is to be fully loaded, and is to have its full store of fuel and water—if these are used—and is also to carry the number of adult passengers for the class in which it is entered, one of whom is to be a representative of the judges, who will be counted as part of the load.

ROUTE MAP.

There will be provided for each competitor, on making application at the office of *The Engineer* three days before the practical working run commences, a route map indicating the course which it is suggested the vehicles shall take, but the competitors will be free to take any road they think proper between the Crystal Palace and their destination and back.

ORDER OF STARTING.

Lots will be drawn to determine the order in which the vehicles are to start. It is intended that the first shall leave at or about 10 a. m., and the remainder at intervals of 10 minutes. During the run the representative of the judges shall keep, on a printed form which he will have with him, a "log" of the run.

CHANGE OF DRIVERS.

Any competitor may change his driver *en route* if he should think proper.

INSPECTION OF VEHICLES ON RETURN.

After the return of the vehicle to the Crystal Palace, it shall again be opened up by the competitor and submitted to the inspection of the judges or their representatives, and this prior to anything being done to the vehicle in the way of repair or renewal, except such as may have been effected during the run.

FURTHER RUNS.

Should the judges so determine, further runs are to be made on subsequent days by all or any of the vehicles in the premises of the Crystal Palace Company or on the public roads.

DISQUALIFICATION.

The judges reserve to themselves the right of absolutely disqualifying any vehicle or competitor from the competition for any infraction of these rules, or for any cause whatsoever, and without in any way being bound to state the reason or reasons for which disqualification is made.

NUMBER OF VEHICLES TO BE EXHIBITED BY EACH COMPETITOR.

No competitor, either directly or by any agent or otherwise, is to enter for competition two similar vehicles in any one of the classes above referred to; and each vehicle is to be entered by not more than one person; that is to say, in the name of one individual or firm.

RESPONSIBILITY.

While obeying in all respects the instruction of the judges, it is to be fully understood and agreed by every competitor that no responsibility, legal or otherwise, is to attach either to the judges, to the proprietors of *The Engineer*, or to the Crystal Palace Company in respect of anything, or for any damage or injury caused to any person or thing, but all responsibility of every sort and kind, whether pecuniary or otherwise, is to attach to the competitor, and is to be borne by him.

LENGTH OF PRACTICAL WORKING RUN.

Any vehicle which does not complete the "practical working run" at a minimum average speed of five miles an hour, to include all stoppages, shall be disqualified. The distance upon which such time allowance will be computed will be fixed by the judges and stated on the route map.

The following are the points which will be taken into consideration by the judges in awarding the prizes:

(*a.*) Distance run without stop for any purpose whatsoever, or without taking or receiving supplies of fuel, oil, gas, electrical, or chemical materials or electrical current or of whatever is employed for actuating the motor. Freedom from stoppages for repairs, adjustment, or for oiling or any other purpose or cause.

(*b.*) Suitability of design and excellence of workmanship, not only of the actuating machinery but of the carriage.

(*c.*) Safety.

(*d.*) Simplicity, durability, accessibility and facilities for repairs and absence of offensive smells.

(*e.*) Time occupied in getting to work and ease of starting.

(*f.*) Speed (up to 10 miles per hour) and hill climbing.

(*g.*) Completeness of control by and certainty and decision of steering and steering gear, and efficiency and durability of brakes and brake gear.

(*h.*) Weight of carriage and motor machinery and appliances.

(*i.*) First cost and (to a limited extent) the cost of working.

(*j.*) General efficiency.

JUDGES' DECISION TO BE FINAL.

The decision of the judges expressed in writing on any point shall be final and binding on all parties, and from such decision there shall be no appeal

COPIES OF RULES TO BE FURNISHED TO EACH COMPETITOR AND SIGNED BY HIM.

Three printed copies of these rules will be supplied to each competitor or his accredited representative, and no competitor will be allowed to deliver his vehicles at the Crystal Palace until he has signed one of these copies, and it has been handed to the editor of *The Engineer* and formally acknowledged and accepted by him. In signing and forwarding this copy of these rules the competitor shall accept all the conditions herein imposed upon him, and shall agree to be bound in all respects by them.

OFFICIAL NUMBER AND STAMP ON VEHICLES.

Prior to the start for the long-distance competition there will be attached to each vehicle, in some convenient place, a card stamped with the judge's seal and bearing upon it the number assigned to that particular vehicle for the purposes of the competition. The seal must not be broken, otherwise the vehicle will be disqualified.

PARAGRAPH TO BE SIGNED BY COMPETITORS.

I agree to abide, and be bound by the above rules and conditions, or any modifications of them which the judges may think desirable or necessary.

Signed..

Address..

Competitor in class....................

....

◆

The Stamped Steel Vehicle Wheel.

The Stamped Steel Vehicle Wheel Company, of Chicago, Ill., who have their office at 50 Euclid avenue, Cleveland, O., are about to put upon the market a new wheel suitable for nearly all kinds of vehicles.

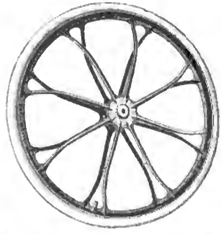
This wheel is the invention of James White, a mechanical engineer, of Cleveland, O., who has had many years of practical experience in various kinds of steel construction.

Expert engineers who have examined the wheel pronounce it mechanically perfect in its construction, and being made of sheet metal it will not be affected by changes of weather, and will virtually last until worn out by use.

At the present time steel is conceded to be one of the best metals now in use for strength and durability and at comparatively low cost, but the company expect to use, as the patent calls for, any kind of sheet metal suitable for the work required.

Some of the first wheels are to be of nickel aluminum sheet, made by the Pittsburg Reduction Company, and will be very strong, light wheels for bicycle or sulky use. For buggies or wagons steel will be used, as the strength of the wheel is only limited by the thickness of the metal, and any trouble or expense arising from the shrinking or swelling of either hub, spokes or felloe, as is the case with all wheels made of wood in the usual way, is entirely overcome in this wheel. The peculiar construction and shaping of the metal is claimed to make a wheel of 25 per cent. greater strength than one made of wood, both being of the same weight.

The general construction of the wheel admits of the use of any practical tire in the market, either steel, solid rubber, cushion or pneumatic. The hub is also stamped out of sheet metal, and connects the disc plates at the centre, forming a base or foundation for the arched chords or spokes, which are stamped from the solid plate *the full size of the wheel.*



At the centre or hub these discs are spread apart enough to give a suitable length of axle with corresponding width of base for the spokes, while at the rim they are securely riveted together with any form of projection suitable to hold the kind of tire used, thus making the wheel strong enough to resist almost any side motion or pressure that can be brought to bear upon it, as has been demonstrated by repeated tests. The hubs are constructed to use either balls or roller bearings, and can be easily changed from one to the other.

As timber suitable for carriage and wagon wheels is becoming scarcer and higher in price each year, while steel is becoming more plenty and at less cost as the production increases, the inventor believes that this wheel fills a growing want for bicycles, buggies, sulkies, wagons, motor vehicles of all kinds, and wheeled agricultural implements.

The company expects to fill orders for wheels in the near future by special machinery and stamping dies, which are now being made by the well known E. W. Bliss Company, of Brooklyn, N. Y., under the immediate supervision of Mr. White, who is vice-president and superintendent of the Stamped Steel Vehicle Wheel Company.

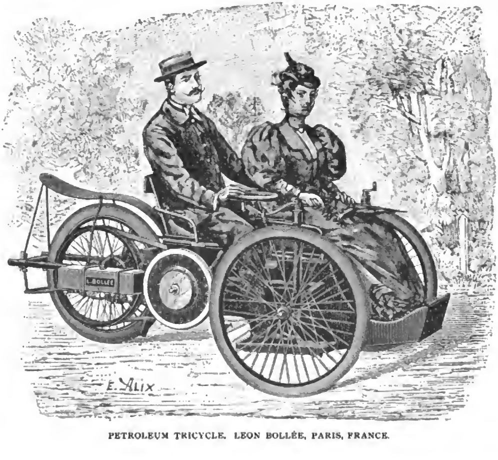
International Motor Exhibition at the Imperial Institute, London.

On Saturday, the 9th of May, the International Exhibition of Horseless Carriages at the Imperial Institute, which was formally inaugurated on Friday, the 1st, by a reception to the House of Lords and a banquet in the evening, was formally opened to the public. It had been intended that the West Quadrangle should be devoted to the practical display of motor carriages in motion, but, owing to the strike in the building trade, the ground could not be prepared in time, consequently a smaller temporary track was provided in the West Garden in front of the band stand. Amongst the carriages and cycles in motion were two oil motor carriages of the Daimler Company; two motor cycles, of the Comte De Dion of Paris; an electric carriage, of the Universal Electric Company, of Victoria Street, Westminster; an oil motor bicycle, by Messrs. Newmayne, of Palace Chambers, Westminster; an electric carriage, by Messrs. Offord, of Gloucester Road; a Lutzmann oil motor carriage, the property of J. A. Koosen, Esq., of Southsea; an oil motor bicycle, of Messrs. Duncan & Suberbie, Paris; two oil motor carriages, of Mr. Arnold, 59 Mark Lane, London. Two of the well-known Kane-Pennington oil motor carriages were also in evidence, but, unfortunately, the Bollée tandem tricycle, which has caused so much interest, and the rights in connection with which had been purchased by the British Motor Syndicate, had been taken back to Paris in order that particulars might be obtained for reproducing it in large numbers, M. Bollée having only constructed this one machine.

In the North Gallery of the Institute were, in addition, several other Kane-Pennington motor carriages, two motor carriages by Messrs. Peugeot, of Paris, two by Panhard & Levassor, of Paris, one motor quadricycle, of Messrs. Loyal, of Paris, one Hildebrand & Wolff-Muller oil motor bicycle, two Serpollet steam carriages, two motor tricycles, the invention of Mr. Middleton, and several others.

In the central section much interest was evidenced in the exhibit of Hiram Maxim, who showed his huge propeller and the 150 horse-power motor which he employed in his huge flying machine, together with a complete model on a small scale, of this famous apparatus. This famous inventor was only deterred from kindly lending his entire flying machine by the fear of difficulties with the County Council in having so large an erection overhanging the public in the grounds. In the flying section were also several other exhibits of gliding machines and aerial apparatus.

In the evening the gardens and verandahs were tastefully illuminated, and the famous band of the Monte Carlo Orchestra gave its first performance before a British public. There was a large and fashionable attendance to witness the opening of the exhibition, to which additional eclat was lent by the presence of His Royal Highness, the Prince of Wales, who, during the evening, inspected the several motor carriages, both in



PETROLEUM TRICYCLE. LEON BOLLÉE, PARIS, FRANCE.

motion and in the galleries, under the guidance of the Hon. Evelyn Ellis, one of the vice-presidents of the Motor Car Club.

Considering the difficulties under which British subjects labor on account of the adverse state of the law regulating these vehicles, one cannot but feel that this exhibition is one of the greatest, if not *the* greatest, motor exhibition which has yet been held; and now that there is every assurance that within the space of a few months the present repressive legislation will be amended, the exhibition will, undoubtedly, prove a great stimulus to native and foreign inventors and designers to bring to perfection the various forms of motor vehicles, for which a great demand has already arisen, and which must increase in every direction.

ARNOLD MOTOR CARRIAGE.

Among the exhibits are to be found examples of the use of steam, oil and electricity as motive agents, and as has been pointed out in the introduction to the official catalogue, each of these three systems has its peculiar advantages and disadvantages.

With regard to steam, it may be said to possess the advantages of greater accumulated and elastic power, simplicity, and to be at present more generally understood than other systems, while its disadvantages are heat, smoke, stoking, carrying of cumbersome and weighty coal and water, unless employing light fuel, such as oil or spirit.

With regard to oil motors, among the advantages claimed for the system are great energy for size and weight, cheapness and portability of fuel, compactness and lightness, simplicity of construction, ease of control, safety, cleanliness, automatic feeding, quickness in starting, low cost of keep, and general efficiency.

Its drawbacks so far have been, especially in the case of light oils, such as gasolene, naphtha, and benzolene, the danger of storing the fluids, while in heavy oils, unpleasantness of smell and excessive deposit of carbon, apparently arriving from imperfect combustion, appear to be their chief defects.

In all systems of gas or oil motors at present adopted, some of the chief difficulties to overcome having been that of noise and vibration, the former proceeding from the intermittent explosions in the cylinder, the latter partly from the same reason, as well as the air suction and moving mechanisms, difficulties which, however, will be found practically overcome in some of the best forms of motor.

In the electric system, which offers, perhaps, the simplest and best control of speed and energy, two sources of power may be employed, namely, either the primary battery, which generates the current in the vehicle itself, or accumulators, which require to be charged from a generating engine or station.

If a primary battery could be devised capable of developing for a sufficiently long period a sufficiency of power with a minimum of weight and cost, this would probably be the ideal form, seeing that an electric motor is continuous and silent, and a vehicle propelled by a primary battery and carrying material for replenishing would be self contained and independent.

A motor carriage, on the other hand, impelled by accumulators as hitherto devised, is necessarily heavy, and being dependent for recharging upon generating stations, is unsuitable for country districts devoid of these necessary sources of power. It is not improbable that both systems of oil and electricity may be employed in the ideal motor of the future, *i. e*, the oil engine to generate the electricity, and the electromotor to convey the power to the wheels.

MOTOR CARRIAGE. L'HOLLIER, GASCOIGNE & CO., BIRMINGHAM, ENGLAND.

Having now touched upon the three chief systems now employed, it will be interesting to learn to what relative extent each system is represented in the exhibition under notice, and by a somewhat cursory glance through the catalogue and examination of the vehicles on view at the time of my visit, I find the numbers to be somewhat as follows: 26 oil motors, six steam motors, six electric motors.

Of course these figures are not worth much; in some cases duplicate vehicles are shown, or different firms show different vehicles, provided with the same motive engine, but perhaps they adequately represent the present great popularity of oil over the other two systems.

Among the exhibits, taking them in the order in which they appear in the catalogue, of which I was able to take particular note, were the following vehicles:

L'HOLLIER, GASCOIGNE & CO.,
7 Bath Passage, Birmingham.

These motors are the result of the invention of M. Roger, of

Paris. The motor is a horizontal one worked with benzene, and the carriage is capable of a speed of from 8 to 30 miles an hour. The carriage which was shown in operation on the ground was a hooded carriage, provided with a Benz system oil motor, electric ignition, and special steering gear. The carriage is completely under control, a strong band brake being provided for use when necessary. The ease with which the carriage described circles and turned corners was remarkable, the wheels being provided with compensating gear for the purpose. I believe the vehicles were formerly fitted with chains for driving the wheels; the one on exhibition, however, was provided with leather driving-bands.

PETROLEUM TRICYCLE. DE DION, BOUTON & CO., PARIS, FRANCE.

GARRARD & BLUMFIELD,
Coventry.

Here is to be seen an electric carriage of somewhat plain appearance, with seating accommodation for four persons, and being simply secured above the framework carrying the motor. There are four wheels, 24 inches, with 4-inch tires, the two front wheels being steered by means of a rod actuated by a worm wheel and screwed in front of the "driver." The accumulators, 24 cells, are placed beneath the seats, and weigh about 500 pounds, the total weight of the vehicle being about half a ton. Speed can be regulated from 3½ to 13½ miles an hour, and is effected in a very novel manner. The spindle which the motor works can be slidden to and fro, so that a pair of rollers carried on the rear end of the spindle may jamb between the surfaces of two heavy metal discs which face each other, one running loose on the other, connected by toothed gearing and a chain with the balance gear, which drives the back wheels. By sliding the roller in or out from the centre of these discs, by means of a lever in the front of the carriage, the speed can be graduated to any degree.

ARNOLD MOTOR CARRIAGE CO.,
59 Mark Lane, London.

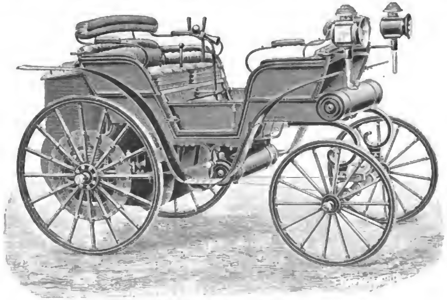
Two acme oil motor carriages were shown, one a "Motor Sociable" for two persons, and the other a motor Victoria, a large vehicle provided with a hood and stronger engine. An illustration of the Sociable is here given.

Here again a Benz motor (horizontal) is used. Motion is communicated from the motor shaft by leather belts to a second shaft, pulleys of different sizes being provided for varying speed, the second motor shaft transmitting its energy to the driving wheel by means of driving chains. Sufficient benzolene can be carried for a run of about 70 miles. The arrangement of the gearing is shown in Fig. 2. The motor is 1½ horse-power. The steering wheels are arranged upon a cross-axle on the Attermann principle, so that the wheels can accommodate themselves to inequalities in the road without jerkiness to the steering handle.

H. KOOSEN, ESQ.,
Southsea, Hants,

showed his Lutzmann oil motor carriage, manufactured by Herr Lutzmann, of Dressau, Germany.

In appearance it somewhat resembles the Arnold Sociable. The front wheels, however, are carried in parts connected by a horizontal arm with a central steering lever. The motive



DAIMLER MOTOR CARRIAGE.

fluid is distilled petroleum, costing about a half-penny per mile run. The ignition is electrical. By moving a lever the speed can be increased or decreased, or the vehicle stopped. A leather driving band is employed, and a powerful band brake works upon a separate brake drum. The cost of this vehicle (for two persons) is about £150.

OFFORD & SONS,

92 Gloucester Road, London, S. W.

This exhibit consisted of a three-wheeled electric dog cart and several very handsome specimens of the carriage builders' art, some light broughams and landaus, and a smart looking dog cart, being especially noticeable. The electric dog cart is provided with a motor driven by accumulators arranged in the body of the vehicle (40 cells in all) capable of propelling the carriage for 40 miles with one charge, recharging costing four shillings. A speed of seven miles an hour is obtained with a 4-hp motor. When fully loaded the vehicle weighs about two tons, including passengers. It is proposed, I believe, to fit the landaus and broughams with electric motors, should the demand for this sort of carriage warrant the necessary alterations.

We next come to the largest show of any individual makers in the Exhibition, that is

THE DAIMLER MOTOR COMPANY (LIMITED),

40 Holborn Viaduct, London, E. C.

Their exhibits include:

A Daimler oil motor omnibus, constructed by Messrs. Peugeot Fréres, of Paris.

Vis-a-vis Daimler motor carriage, constructed by Messrs. Peugeot Fréres, of Paris.

Daimler oil motor Victoria with 4-hp motor.

Daimler oil motor tramcar fitted with 2-hp engine having three speeds up to 18 miles per hour, with reversing gear; gauge, 600 mm.

Motor omnibus to seat four persons and driver, constructed by Messrs. Panhard & Levassor, of Paris.

Motor carriage for two persons, constructed by Messrs. Panhard & Levassor for the Hon. Mr. Evelyn Ellis.

As the Daimler motor is now so well-known, and has been so often described, I shall not repeat the illustrations which have already appeared in The Horseless Age.

As illustrating the advance which has taken place during the last 10 years, it is interesting to notice the example of a motor horse, constructed by Gottlieb Daimler, of Cannstatt, Germany, in 1886, and also an experimental motor quadricycle contructed by him in the same year

HUMBER & CO. (LIMITED),

Beeston, Nottingham.,

were down in the catalogue to exhibit several Kane-Pennington motor cycles, but they were not in evidence at the time of my visit, and an oil motor quadricycle, by M. Loyal, of Paris, appeared also to be *non est*.

THE BRITISH MOTOR SYNDICATE COMPANY,

15 Holborn Viaduct, London. E. C.,

however, showed several Kane-Pennington motors and motor cycles, one being propelled or assisted propulsion, by a fan propeller at the rear. By the use of an inclined plane, rising to the height of two feet only, the Pennington bicycle is said to have been made to jump the extraordinary distance of 65 feet, alighting on its rear wheel, thus enabling the rider to keep his seat without difficulty.

The Kane-Pennington engine and motor cycles and Victoria are so well known both in England and the States that detailed particulars of them here are unnecessary. The Victoria, which Mr. Pennington claims has already traveled some 15,000 miles, was on view and looked good for many more thousands of miles.

The Pennington tandem bicycle was in the building, but not on view the day I called.

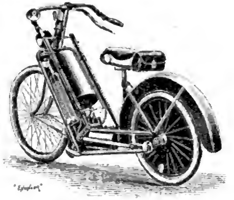
The same firm showed the oil motor bicycle of Comte de Dion and M. Bouton, of Paris.

This machine is driven by a small Daimler motor, the cylinder of which is kept cool by radiating fires, there being no water jacket. The crank shaft is fitted with a pinion gearing into an external spur wheel which drives the main axle through a compensating device and chain. Pedals are provided for starting the vehicle and assisting the motor when a hill has to be negotiated. Altogether it is a very taking and smart looking machine.

DUNCAN, SUPERBIE & CIE.

Paris,

showed several oil motor tricycles and a bicycle illustrated in the March issue of The Horseless Age.



It is the invention of Herr Muller, of Munich, and is a popular machine in France. It is driven by a petroleum motor, the supply tank being fitted in the front of the machine between the double set of tubes, and containing sufficient for a 12 hours' run at a speed of 15 to 20 miles an hour. The water reservoir for cooling the cylinders is over the back wheel, being an arch-shaped vessel, and also acts as a mud guard. To prevent the back (driving) wheel from "skidding," the rider's seat is placed right over it. Speed is regulated by means of a curved screw operated by two fingers. To stop suddenly it is only necessary to press the lever down, by which the reservoir valve is closed, the pistons then acting as an automatic brake. The machine appears somewhat heavy and unhandsome, but it also appears to have given satisfaction to its users.

AMEDÉE BOLLÉE, OF LE MANS, FRANCE.

A machine which does not appear in the catalogue, and which only appeared for a short time in the exhibition, was shown by the above firm, and probably attracted more attention than any other exhibit. This was the Automobile Cycle, the invention of M. Léon Bollée.

The tricycle seats two persons tandem, and weighs about 350 pounds. It is constructed of steel tubing and has large pneumatic tires. Unlike the ordinary tricycle the single wheel is in the rear and is the driver, while the steering is applied to the two front wheels. This arrangement together with the low build gives great stability and safety.

The operator of the machine occupies the rear seat, and has at his right hand the steering lever, and at his left a lever which applies the brake and regulates the speed. A slight movement of the lever serves to change the speed, while a full movement throws the motor out of gear, and at the same time applies the brake. Ignition is effected by a special tube of M. Bollée's invention.

The motor is of two horse-power, and is not jacketed.

This "voiturette," as it is termed in French, has three changes of speed, the highest about 20 miles an hour, and will ascend ordinary grades at a speed of eight or ten miles an hour. While standing still some vibration is noticeable, but while in motion it is not felt. Noise and odor have not been entirely eliminated by M. Bolliée, but the general impression of the vehicle was so favorable in London that the Horseless Carriage Company, Ltd., immediately secured the rights to the invention in England. When the vehicle was first exhibited on the streets of Paris M. Bollée took orders for several hundred of them.

The machine ran down to Coventry from London, and the *Autocar*, the English motor journal published there, states that the Locomotives Act was completely forgotten in the enthusiasm which the trim little vehicle evoked, the venerable Mayor of the city and other officers of the law taking delight in "riding through the act" at a speed that would have horrified the authors of that measure.

The organizers of the Paris-Marseilles race made no provision in their classification for vehicles of this kind, but the members of the committee are all so well pleased with it that they have unanimously voted to make a new class especially for M. Bollee's benefit, and he has accordingly entered his machine in the race.

Final Arrangements for the Cosmopolitan Race.

Several changes have been found necessary in the amended programme of the *Cosmopolitan* race. The Park Commissioners refuse to allow the vehicles to race through Central Park, limiting the speed to eight miles an hour. Hence the race will start and end at High Bridge.

The city authorities have consented to the use of the City Hall Park as an assembling ground, and the vehicles will accordingly report there on the morning of the race.

W. Seward Webb having been called to Europe unexpectedly, Chauncey M. Depew has been appointed to take his place on the board of judges.

Two timekeepers, one at High Bridge and the other at the Ardsley Country Club will take the official time of the vehicles, and each vehicle will carry an umpire who will be appointed by the judges. Among those who are mentioned as likely to serve in this capacity are Charles B. King, treasurer of the American Motor League, Arthur W. White, Henry Villard and Henry R. Worthington, the latter the well-known pump manufacturer. Several other gentlemen prominent in social and scientific circles are said to be candidates for the same positions.

At the Ardsley Country Club a gala assemblage is expected. The magnificent club house is to be dedicated on that day and many distinguished members and guests will be present. An unequaled opportunity will therefore be afforded inventors of exhibiting their vehicles to intending purchasers and investors.

The need of a headquarters for vehicles participating in the contest has been most happily supplied by the International Permanent Exhibition Company, who have offered free of charge a portion of their great structure, the Grand Central Palace, for this purpose. The building, which was briefly described in the last issue of THE HORSELESS AGE, is admirably located and is fully equipped with every facility for transacting business, running vehicles, making repairs, etc.

Here space will be given gratis for several days previous to and following the race, and as the Electrical Show, one of the most successful trade exhibitions ever held in New York, is now in progress there, thousands would be attracted to the motor sections, many of whom would be possible purchasers or investors.

The management of the International Permanent Exhibition Company are taking a deep interest in the motor question. In making this generous offer they have done the right thing at the right time, and the *Cosmopolitan* contestants will no doubt be quick to take advantage of it.

Grand Central Palace, or the Industrial Building, as it is also called, is located at Forty-third Street and Lexington Avenue, and is readily accessible by all main city transportation lines.

The route of the *Cosmopolitan* race is very hilly. Throughout the entire course there is scarcely a level stretch of sufficient length to permit of high speed. The severest hill-climbing test will be found in the city of Yonkers, where there is a steep incline of about a mile in length, and considerably over 15 per cent. in one part. Many ruts will be encountered by the contestants, so that high speed cannot safely be made except for very short distances. Under such circumstances fast time cannot reasonably be expected.

LIST OF ENTRIES.

Hartley Power Supply Co., Chicago, Ill.; The Emerson-Fisher Co., Cincinnati, O.; W. M. Webber, Parkersburg, West Va.; L. E. Walkins, Dorchester, Mass.; Tinkham Cycle Co., New York; J. W. Eisenhuth, San Francisco, Cal.; H. W. Heaton, M. D., Olneyville, R. I.; Wallace Grant, Brooklyn, N. Y.; Roger American Mechanical Carriage Co., New York; Duryea Motor Wagon Co., Springfield, Mass.; Wood & Meagher, Richmond, Va.; W. J. H. Kappe, Quincy, Ill.; Hinsdale Smith, Springfield, Mass.; Chas. S. Caffrey Co., Camden, N. J.; Walter McLeod, Cincinnati, O.; P. E. McDonald and W. F. Brennan, Chicago, Ill.; Morris & Salom, Philadelphia, Pa.

In addition to the above the following persons or firms made inquiries in regard to the race, and had hopes of competing:

Henry C. Weeks New York; G. R. Clark, Corry, Pa.; American Electric Vehicle Co., Chicago; W. T. Harris, Philadelphia, Pa.; Dr. Carlos C. Booth, Youngstown, O.; The New Power Co., New York; Sintz Gas Engine Co., Grand Rapids, Mich.; Bert McEwan, Saratoga Springs, N. Y.; R. H. Macy & Co., New York; Pope Manufacturing Co., Hartford, Conn.; C. B. Richard & Co., New York; The Lengert Co., Philadelphia, Pa.

Out of the above lists the following have signified their intention to compete:

The Emerson & Fisher Company, L. E. Walkins, J. W. Eisenhuth, Duryea Motor Wagon Company, Wood & Meagher, P. E. McDonald and W. F. Brennan, the Lengert Company and Dr. Carlos C. Booth. Several others are still in doubt.

Wood & Meagher's Motor Vehicles.

Wood & Meagher, mechanical engineers, of Richmond, Va., enter two vehicles in the *Cosmopolitan* Road Race, a four-wheeled carriage and a bicycle. The two are actuated by motors of radically distinct types.

The fact that patent papers are now pending on both devices deters them from giving a clear exposition of the peculiarities of construction involved, but they are willing to state some broad features which, to the engineer, will be a sufficient explanation of the novel points.

The carriage motor is a compound or double expansion power generator, to all intents and purposes an ordinary compound engine. Steam is not used, however, but any of the volatile fluids, such as alcohol, bi-sulphur carbon, ether, naphtha, etc. These fluids are used expansively. The distinctly novel feature of their method of generating power consists in the means employed to vaporize the fluid. This they claim to accomplish without fire, electricity or chemical action. After operating the pistons the vapor passes to an ordinary condenser, and thence returns to the motor.

They claim to obtain by the above means a uniform, positive power which the gas explosion engine can only approximate, but never fully attain. The factor of overheating is effectually dispensed with, while the motor is as safe as ingenuity can hope to make a power generator. It is their opinion that uniformity of power renders possible the use of a lesser effective horse-power than where the impulse is intermittent and subject to variation.

As to weight and compass, the former is for a two horse-power motor, with all connecting parts complete—condenser and generator inclusive—42 pounds. With charge for 10 hour's constant service at 30 miles per hour the weight is increased six pounds. Of this additional weight five pounds becomes a constant to all intents and purposes, consisting of the volatile fluid which can only escape gradually as is largely unavoidable in the condensing system. Special precautions have been taken to minimize this loss.

To run a 2-hp motor for 10 hours at its highest speed costs 5 cents. This is a broad assertion, the inventors admit, and would not be ventured if extended experiments had not made it justifiable.

The bicycle motor used is a modification of the gasolene engine and consists merely of a cylinder, piston and carburettor. One explosion per revolution is obtained with one cylinder. While they doubt the efficiency of this motor on a carriage when compared with the motor just described, they have found it eminently satisfactory as the driver of a light vehicle such as the bicycle. The motor develops three-quarters of a horse-power, and weighs complete, with one gallon of gasolene, 14 pounds. It gives a speed of 30 miles an hour.

The inventors' idea has been to produce a motor which could be attached to any bicycle without involving any departures in the present construction. This they believe they have succeeded in accomplishing and will shortly place the device on the market. The price will bring it within the reach of all, as they say they can mount this motor on a wheel complete for $25 and make a satisfactory profit.

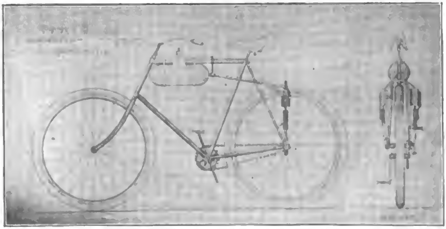
The motor cycle which they now have under construction differs somewhat from the illustration here given. One cylinder only is now used, and its position on the machine has been changed.

On account of delay in the shipment of tubing and other important parts that were being made in the North, Wood & Meagher found it impossible to complete their motor carriage for the *Cosmopolitan* contest. They hope to have the motor cycle on hand, however.

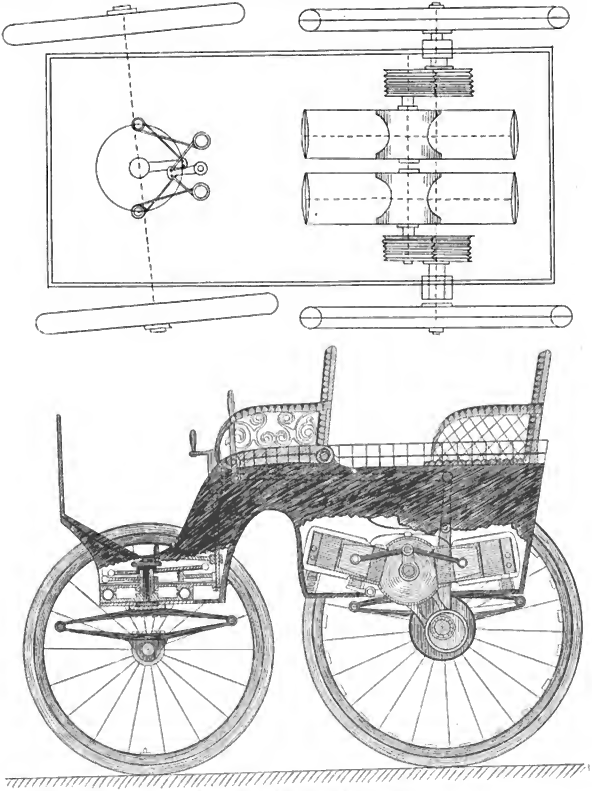
No Rules Yet Formulated for the Providence Race.

The promoters of the Providence Race have not yet announced their rules and regulations, but expect to be able to do so early in June. A very extensive correspondence is being carried on with motor inventors in various parts of the world, and a large number of entries is assured.

F. E. Perkins, president of the Rhode Island State Fair Association, and Wm. Hanrahan, assistant secretary will be present at the *Cosmopolitan* contest.



MOTOR CYCLE. WOOD & MEAGHER, RICHMOND, VA.



DIAGRAMS OF EISENHUTH MOTOR CARRIAGE.

Sir David Salomons on Steam Motors.

Sir David Salomons, the English savant, and one of the leaders of the motor vehicle cult in Europe, favors steam motors for vehicles. He gives as the ground of his belief the following reasons:

1. The operator need not descend from his seat to start the motor.
2. The power is variable, according to the demands made upon it.
3. The motor can be easily stopped and started at any time.
4. The lightness of the motor.
5. Absence of all dangerous liquids.
6. Any mechanic can repair the motor.
7. Freedom from vibration and odor.

The disadvantages of steam be then enumerates:

1. The danger that always attends the use of a boiler.
2. The large amount of water it is necessary to carry.
3. The trouble of making a fire.
4. The escape of the exhaust.

These disadvantages, he believes, have been entirely overcome in the steam wagons of M. Serpollet, which he regards as the most perfect yet constructed. He has accordingly ordered one of these vehicles built according to his own design. The motor will be a compound engine The body of the vehicle will be separated from the running gear, and will rest on springs ; the framework will be so constructed that different bodies can be fitted upon it without trouble. Kerosene will be employed as fuel instead of coke, which M. Serpollet has used up to the present time.

Sir David does not favor the electric vehicle in the present state of the art.

◆

The Hydro-Carbon Launch Co.

A. Kingsland Hiscox, an experienced mechanist, and F. K. Grain, proprietor of the Noroton Boat Works, Noroton, Conn., have organized the Hydro-Carbon Launch Co., with office in the American Tract Society Building, corner of Nassau and Spruce Streets, and works at some point not yet selected in the immediate vicinity of New York. The new company has secured the exclusive agency in this territory for the Wolverine motor, made by the Wolverine Motor Works, Grand Rapids, Mich., and will build boats from 14 to 100 feet in length, propelled by this motor. Steam launches up to 175 feet in length will also be constructed by them. Mr. Hiscox is the business manager of the new concern, and Mr. Grain the superintendent of boat construction.

◆

The Lambert Carriage Motor.

J. W. Lambert, inventor of the Lambert gas engine, manufactured by the Buckeye Manufacturing Company, Anderson, Ind., has just completed a special carriage motor modeled after the Lambert stationary engine.

This motor weighs about 350 pounds, and develops three brake horse-power.

It is equipped throughout with poppet valves, which are said to be positive in their action.

The governor is very sensitive, giving such control of the motor that the speed can be changed from 150 revolutions to 400 revolutions a minute without stopping it.

The Eisenhuth Motor Carriage.

John W. Eisenhuth, of San Francisco, Cal., has probably devoted as much time and money to the study of the gas engine as any man in the United States. He has built a number of different styles of gas engines, and taken out many patents under this head. His experience in this line has naturally caused him to take a very lively interest in the motor carriage, and it is not surprising to find his name among the entries in the *Cosmopolitan* race. It is surprising to know, however, that he did not commence the drawings for his carriage until March 25, and has succeeded in producing a motor carriage in a little more than two months. The work has all been done in Newark, N. J., Finter & Co., having built the carriage work, Phineas Jones & Co, the wheels and Strecky & Hech the motor.

The carriage is on the trap order, and has seating capacity for four persons.

The wheels are 38 and 44 inches respectively, and are fitted with 2½ inch Columbia pneumatic tires, made by the Columbia Pneumatic Wagon Wheel Company, Oneida, N. Y.

The motor is a four-cylinder Eisenhuth gas engine, specially designed for locomotion. By means of a variation of the mixture its power is made to vary from 4 horse up to 15 or 20 horse-power. It is hung on springs over the hind axle, the cylinders being put on an angle to avoid all dead centres, and being so nicely counterbalanced that all vibration is avoided.

The automatic cut off is one of the features on which Mr. Eisenhuth prides himself, the action being very similar to that of a steam engine. Unlike most gas engines, the motor will run as low as 50 revolutions to the minute, and will not race when thrown out

An explosion is obtained every other revolution, and all its bearings are of an improved ball type invented by Mr. Eisenhuth, and somewhat resembling roller bearings in construction.

The cylinders are water jacketed, and the inventor calculates that a supply of five gallons of water is all that will be required for a 50-mile run.

The motor makes no noise in operation, and the mixture in the explosion chambers is so perfect that no disagreeable odor is noticed.

Speed is regulated by the motor itself, and depends upon the nature of the charge admitted to the cylinders Speed is claimed to be limited only by the condition of the road, and the operator's ability to maintain his equilibrium.

The steering is compound, and is managed by a ball-bearing fifth wheel operated by a small vertical lever at the side of the seat. The carriage can also be steered from the rear seat.

The frame of the vehicle is of 1¼ inch tubular steel. The motor is of malleable iron with the exception of the shaft, which is of steel. The carriage axle is also of steel, but in some of the other parts bronze was used because of the lack of time to secure suitable steel castings. This has necessarily added somewhat to the weight, but even as it stands the carriage tips the scales at only about 800 pounds.

One peculiar feature of the motor is that it has no base. It is hung on the shaft, and all working parts are enclosed in a dust-proof case. All the valve gears are between the cylinders, and are therefore fully protected. Double-seat poppet valves are used.

The entire weight of the motor is 280 pounds. The stroke is 5½ x 6 inches, and the piston is 5¾ inches in length.

The motor is reversed by a spring-controlled lever near the seat.

The inventor believes that he has the only motor which will run up to 900 revolutions a minute under work and will not fire back.

Ignition is electric, a battery being used for the purpose, but Mr. Eisenhuth is designing a dynamo or generator for this purpose. The electrodes employed in the igniting mechanism are covered by patents, and are claimed to be absolutely reliable. There are no springs in the cylinders to get heated, and as the electrodes stand still when not needed, wear is reduced to a minimum.

Power is transmitted by a 1¼ inch cable and friction, which is perfectly noiseless and under absolute control. The carriage starts smoothly, without jerking, and runs with equal ease at all speeds.

Mr. Eisenhuth has a number of improvements in mind. He proposes to carry fuel in the form of bricks, which are not inflammable until immersed in a liquid solution, when an explosive gas is given off. He is also working out a light vehicle for two passengers, which will be of bicycle construction, and will not exceed 100 pounds in weight.

Before his return to California he will doubtless make arrangements for the manufacture of these vehicles in the East.

He is one of the pioneer inventors in this line, having given considerable thought to the subject for eight years.

The carriage entered in the race was built on such short notice that the ornamental painting had to be omitted.

The Cook Motor Carriage.

James M. Cook, of Mt. Gilead, O., is the inventor of the motor carriage which is illustrated herewith and which has been patented and put into practical working shape by Thurman & Silvius mechanical engineers of Indianapolis, Ind.

The machine is provided with all of the latest improvements, and is designed for the convenience of the operator and occupants. Fig. 1 is a side elevation of a carriage to seat six people; Fig. 2 is a longitudinal sectional view showing the motor, gearing and attachments for steering the machine. The machine will weigh about 720 pounds. The diameter of the front wheels is 34 inches, of the rear wheels 40 inches; width of body 32 inches; length of body 8 feet 6 inches.

The motor is a two cylinder gasolene engine with cylinders 4 x 4, and has a base of 12 x 14 inches; height, 18 inches, and develops four horse-power.

The gearing of the machinery is placed in the housing underneath the two rear seats, and the gasolene tank underneath the front seat, has a capacity of fuel for a 200-mile trip. The front and rear wheels are provided with heavy pneumatic tires. The motor is controlled by one lever, and the steering of the vehicle is done by means of a lever and a quadrant actuating a bevel gearing on the front axle.

The machine has a changeable speed of from four to twenty-four miles an hour, without interchanging the gear by stopping. The lever to change the speed is located at the rear of the front seat. The whole machine is under perfect control of the operator, and by the mere turning of the lever, which has the different speeds indicated thereon, any speed between four and twenty-four miles can be attained. The machine is simple, compact and comparatively inexpensive to manufacture.

The most notable feature about this vehicle is the changeable speed, accomplished by means of friction clutches actuating the gears. The machine can be run backward as well as forward, and is provided with excellent springs. There is little noise or odor from the motor. The fuel will cost from one-fourth to three-eighths of a cent per mile, and the amount carried is from 10 to 12 gallons.

The brake arrangement consists of a thin sheet of band steel around the fly-wheel of the motor, which is actuated by means of a foot lever convenient to the operator, and upon pressing this lever it causes a friction and thereby decreases the momentum of the motor.

Aluminum in Motor Vehicles.

The horseless age is fortunately contemporaneous with the aluminum age, and this latest discovery in the metal industry is likely to play an important part in the development of the motor vehicle industry.

Lightness and strength combined are the great desideratum in motor-vehicle construction, and as the aluminum alloys weigh only about one-third as much as iron of the same bulk, it will be seen that the new metal is admirably adapted for the purpose.

The Pittsburg Reduction Co., the largest manufacturers of aluminum alloys in the country, have had many calls upon them of late from builders of motor vehicles. In machinery and framework, rims of wheels, etc., their alloys are found to be much superior to the older metals.

The two alloys which they recommend for motor carriages are their Special Casting Alloy, which, at 27 cents a pound, is about as cheap as brass, the specific gravity of brass being nearly three times as great; and, where greater strength is required, their Nickel Aluminum Casting Alloy, claimed to be the strongest aluminum alloy on the market.

Mr. James C. McGuire, consulting engineer and manager of the company's New York offices in the Havemeyer Building, states that they have recently made machinery, housings, frames, wheel rims, wagon bodies, etc., for motor vehicles. The only parts for which they do not recommend it, are those where it would be subjected to a temperature of over 200 degrees C.

A New Storage Battery.

Blount & Otto, Havemeyer Building, New York, have secured the exclusive agency for the American electric storage battery, a new battery which has achieved great success in the West, and is now to be introduced in the East. It is said to be superior in life and efficiency to all other storage batteries now on the market, and is largely used and recommended by the Pullman Palace Car Company for lighting cars. It is specially adapted to the propulsion of launches and carriages. At the World's Fair this battery received the highest award.

The Parade Tabooed.

The aldermen of New York, on Tuesday, May 26, refused permission to John Brisben Walker to hold a parade of motor carriages through the streets of New York on Decoration Day, on the ground that it would interfere with the parade of the Grand Army veterans, who still wield a considerable political influence. The demonstration must therefore begin at High Bridge and end there.

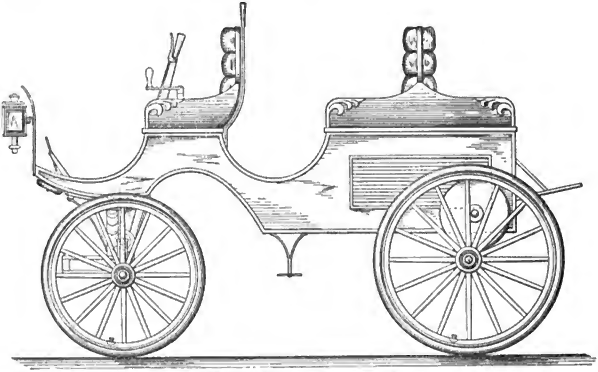


FIG. 1.—THE COOK SIX-SEATED MOTOR CARRIAGE.
(Designed by Thurman & Silvius, Mechanical Engineers, Indianapolis, Ind.)

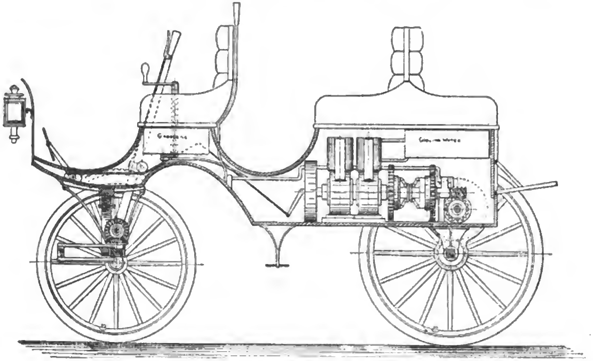
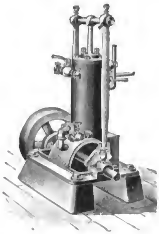


FIG. 2.—LONGITUDINAL SECTIONAL VIEW OF THE COOK MOTOR CARRIAGE.
(Designed by Thurman & Silvius, Mechanical Engineers, Indianapolis, Ind.)

The Wing Gasolene Motor.

L. J. Wing, of L. J. Wing & Co., 109 Liberty Street, New York, has perfected a gasolene motor, which is specially designed for motor wagons and light stationary work.

The motor illustrated here gives two brake horse-power, and has a speed of 300 revolutions a minute, with an impulse every revolution instead of every other revolution. It runs equally well in either a horizontal or a vertical position, and all wearing parts are easily accessible. No gears whatever are employed, and vibration is almost entirely overcome by a new principle of construction. Perfect lubrication is accomplished with one lubricator.



L. J. Wing & Co. are preparing to turn these motors out in large quantities. They are also selling agents in the metropolitan district for the well-known Globe gas engine, which has an established reputation for marine and heavy stationary work.

* * *

To Popularize the Electric Vehicle.

The Electric Carriage & Wagon Company was recently incorporated under the laws of the State of New York, to introduce electric vehicles in the City of New York. A central station or livery will be established somewhere in the vicinity of Central Park, where batteries will be recharged and the entire care of the vehicle will be assumed. It is the company's intention to rent their vehicles at lower rates than are now current among livery stable keepers in the metropolis.

The capital stock of the company is $300,000, and the directors are: W. W. Gibbs, William Halls, Jr., Richard B. Hartshorne, P. Lewis Anderson, Henry G. Morris, Isaac L. Rice and Pedro G. Salom.

The company has offices at 66 Broadway, New York, and room 926 Drexel Building, Philadelphia.

C. E. Woods and C. E. Corregan, of Chicago, Ill., have organized the American Electric Vehicle Company, and will build the various styles of electric vehicles designed by C. E. Woods, and illustrated and described in the January issue of THE HORSELESS AGE. The company has opened offices and showrooms at 447 Wabash Avenue.

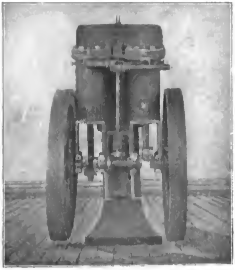
The Maginn Motors.

M. Maginn, a mechanical engineer of Chicago, Ill., has been engaged in developing a light gas motor for nearly a year past. He entered in the *Times-Herald* race last Fall, but was unable to compete. He has kept steadily at work ever since, and has finally brought his motor to a point where he is satisfied to begin to manufacture.

The Maginn motors are of two kinds, two and three cylinder.

The weight of the two-cylinder motor is 48 pounds, and it is said to develop one horse-power. It runs on either coal gas, natural gas or gasolene, and is specially recommended for light stationary work and for the propelling of light tricycles carrying one person. It is made in two styles, vertical or horizontal.

Among the claims advanced for these motors are the following: A one-half turn of the fly-wheel starts the motor and is positive; two impulses are given at each revolution, and without compressing the charge, hence the motor develops less heat and makes less noise than a compression motor; the space occupied is 12 x 8 x 5 inches without fly-wheels; the cylinders and machinery are all secured in one casting, and are fixed to the bed-plate or base by two bolts, on removing which a light skeleton motor is obtained, weighing but 18 pounds; the consumption of gasolene is 3 quarts for 10 hours, and for stationary purposes a common 6-foot gas burner per hour supplies its full capacity.



The Maginn Power Generator & Motor Co., which has been organized to manufacture these Maginn motors, have taken offices in the Manhattan Building, 307 Dearborn Street, and are making active preparations to supply the trade. They will build light tricycles complete and also furnish the motors for other manufacturers.

They will soon place on the market a three-cylinder, horizontal or vertical motor, which gives three impulses every revolution and has no dead centres. This motor will be particularly adapted for small boats.

COMMUNICATIONS.

Invitation to American Inventors.

SIR:—If you have a motor car or motor cycle, or any appliance connected with them, you should exhibit at the International Horseless Carriage Exhibition at the Imperial Institute, London, which opens May 9, and closes Aug. 8.

No charge for space will be made to *American exhibitors* of motor vehicles and their accessories, and assistance will be given in the cost of freight to inventors requiring such help.

The Imperial Institute is in the centre of the wealthiest part of London, is under the patronage of the Queen and Presidency of H. R. H. the Prince of Wales, and this will be the first exhibition of the kind held in this country, where motor traffic is the sensation of the moment. This exhibition will be the rage of the London season.

While there are thousands of wealthy persons in this country ready to buy motor vehicles, England has practically not begun to make motor carriages, as the law is only now being altered.

The Motor Car Club, which is directing the exhibition, has 3,000 inquirers for motor cars on its books and the command of unlimited capital to purchase and assist good inventions, and has already negotiated the purchase of American, German and French inventions involving upward of a quarter of a million sterling.

America is already greatly in advance in motor cars, and Americans, to secure the future trade with this country, should not fail to exhibit their productions here.

Upward of £1,000 sterling will be offered for competition in models and prizes.

Arrangements can be made for taking care of any exhibit sent to the Institute unaccompanied.

If you cannot send in time for the opening your exhibit will still be accepted within a reasonable time afterward.

Prospectus and forms are sent herewith.

I am, yours obediently,
C. HARRINGTON MOORE, *Hon. Secretary.*

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To the Inventors, Makers and Owners of Motor Carriages.

GENTLEMEN:—We will hold at our Exposition-Fair, Sept. 7 to 11, a speed contest and exhibition of horseless carriages. Preliminary announcement of the same will be found in the April issue of THE HORSELESS AGE, E. P. Ingersoll, publisher, New York City. The contest will be held under the auspices of our association, and a guaranteed sum of five thousand dollars ($5,000) will be awarded in prizes suitably divided. The rules and conditions to govern have not as yet been fully formulated. On these points, you will, if you desire, be informed from this office as soon as practicable. We would meanwhile be pleased to receive from you any suggestions of a general or special nature that in your judgment can be utilized to the benefit of the contest.

Trusting that you will be able to take an active interest in the matter, we remain, Very truly yours,
R. I. STATE FAIR ASSOCIATION.
Wm. Hanrahan, Assistant Secretary.

From the Islands of the Pacific.

HONOLULU, H. I., April 24, 1896.
Editor Horseless Age:

DEAR SIR: The sample copy of your splendid paper, THE HORSELESS AGE, came all right, and I must say I was very much pleased with it. Keep up the good work. Enclosed find $2.50 for one year's subscription for THE HORSELESS AGE. I should like you to let me have all the back numbers, with the exception of January, 1896, which is the sample copy that I have. I should like to start from the first. Again I say, keep up the good work. C. R. DEMENT.

Daimler Launches in Demand.

Increase and extension is the order of the day at the works of the Daimler Motor Company, Steinway, Long Island. A new boat shop, 200 x 100 feet, is being constructed down by the water's edge, about one quarter of a mile from the main plant, and much new machinery is being added in all departments. The improvements of the near future will include a new testing room 68 x 42 feet.

The demand for Daimler launches is increasing constantly, the company's greatest difficulty being to turn them out as fast as they are wanted. The boats now under construction vary in length from 16 to 53 feet, and include both open and cabin styles. One of the best examples of their work is a 53-foot cruising launch for Frank R Wells, of Burlington, Vt. It is 11 feet 10 inches beam, has a saloon with plate-glass doors, upper deck of light grating of oak with portable brass stanchions and awning, galley, toilet, and is provided with rigging like a sailboat.

Power is furnished by two 12-hp Daimler motors driving twin screws, and a maximum speed of 12 to 14 miles an hour will be attained.

The reversing lever is handled from the pilot house.

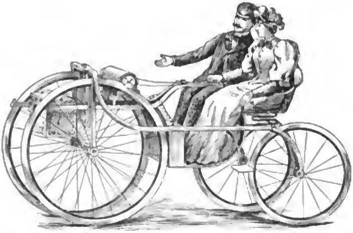
W. J Van Patten, another resident of Burlington has purchased a 33-foot cabin launch propelled by a 7-hp Daimler motor. The cabin forward is enclosed in glass, while aft is standing room sheltered by canvas storm curtains. The cabin is finished in mahogany, and all the needed conveniences are found within it.

Among their other patrons at present are Louis L. Lorillard, Henry E. Abbey and Adam Weber. The launch which is being built for the latter gentleman—a 33-foot clipper stem boat of 8-foot beam, propelled by a 7-hp motor, will be run to South Boston and delivered there to the purchaser by one of the company's employees.

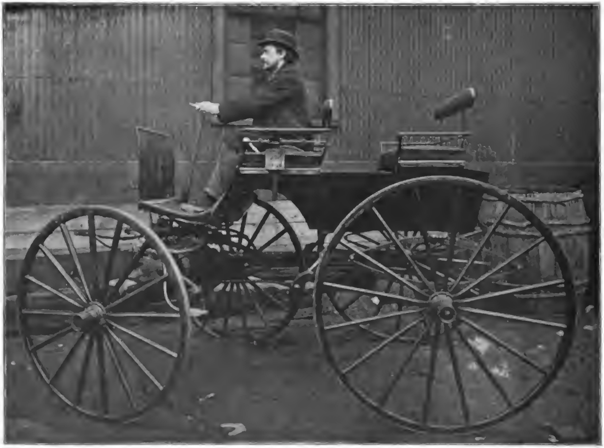
The new Daimler carriage which was exhibited at the Sportsmen's Exposition is occasionally taken out to allow visitors a chance to judge of its merits. The editor of THE HORSELESS AGE was favored with a ride on his last visit to the Daimler works, and was much pleased with the working of the carriage on such abominable roads as the village of Steinway, in common with most other American villages, is obliged to put up with. The carriage ascended a 15 per cent. grade with ease, and demonstrated the solidity of its construction by the manner in which it withstood the constant and severe shocks of the road, which was literally strewn with stones of large size.

The company state positively that they will have a number of different styles of carriages to show in a few weeks.

The Government recently purchased one of the new Daimler kerosene stationary motors.



THE BARROWS MOTOR VEHICLE.



ELECTRIC VEHICLE. L. E. WALKINS, DORCHESTER, MASS.

The Walkins Motor Vehicles.

The Self-Contained Equipment Motor Vehicle Co., of Dorchester, Mass., enters in the *Cosmopolitan* race two vehicles, electric and gasolene, both fitted with a power transmitting device invented by L. E. Walkins, a civil engineer of Boston.

The gear shown in the accompanying sketches is drawn double the size that it may be better understood.

The electric wagon, which was first completed and is here shown, is a Kimball-Beach wagon, seating four passengers, and has cushion-tired wheels with wooden spokes. The steering gear is of simple design, using a sprocket from the steering wheel to a toothed gear on a rack on the axle of the forward wheels. The motor is patented, and is claimed to be the best made for the purpose.

Four steel sprocket wheels, designated by letters *A*, are fitted to a steel frame designated by letters *K K* and *J J*. The two forward ones, one on each side of the steel frame, run on ball bearings, the two rear, one on each side of steel frame, are fastened to the axle of the wheels. The pinion or idler sprocket wheel (letter *C*), is on ball bearings attached to a lever shaft *E*, secured to two holders *D D*, which rise and fall on steel guides *H H*, to keep the twisted sprocket chain tight, as it runs on the motor sprocket pinion wheel *W*. The sprocket chain gear makes the twist shown and it is so adjusted that at crosses it clears full two inches. Both the idler sprocket wheel and the power sprocket wheel *W* run on ball bearings. This complete set is duplicated on the other side as shown on Plan 2, both being connected by light steel flat rods with web joints. All parts are strong and of light construction. The motor is balanced on the steel frame at the centre and works both sides, as in Plan 2.

The whole frame, sprocket wheels, etc., is of strong and light bicycle construction. On the axle of the rear wheels four sprocket wheels are fastened, two running on the twist sprocket gear and two on the straight sprocket gear. Thus the full power of the motor is given to the axle. The motion is silent, easy and highly efficient, as tests have demonstrated.

The steel frame containing the gear runs on ball bearings on the axle free, and is not connected with the wagon springs shown on the axle or between same and the body.

The front end of the steel frame is secured to the body with the spring letters *P O* at *L* and *N*.

The company is constructing three road vehicles, of which the electric is completed, and the gasolene one nearly so. The latter is exactly like the accompanying drawing except that where the electric motor is shown a gasolene motor is used.

The storage battery is placed under the two seats, and is of special make, weighing 700 pounds, and giving twelve ampere hours.

They claim for their gear 70 per cent. better results as to economy in power and traction over any other gear yet devised. The vehicle here shown is said to have ascended grades at a speed of 10 miles an hour and kept it up through sandy highways for 10½ hours at a cost of 12 cents an hour for power.

The two vehicles are entered in the *Cosmopolitan* race, in the Franklin Park Exhibition, Boston, July 4, and at the Providence Race, Sept. 7.

The electric carriage is said to have made a run of 88 miles on one charge over the roads of Central and Western Massachusetts.

The Barrows Motor Vehicle.

Of this vehicle the inventor says that it is not exactly a "horseless carriage," but practically a whole team, horse and all, except that the horse may be an electrical horse, a gasolene a compressed air horse, or any kind of a mechanical animal instead of the old-fashioned "hay motor."

The "horse" part consists of the large front driving wheel, which also carries the motor, and this wheel may be attached to any kind of light vehicle, for business or pleasure, including a sleigh.

The inventor's great claim is simplicity. There is no intermediate machinery whatever, except the little rod that changes the two speed pulleys.

The motor, of whatever kind it may be, is supported by and carried on the steering lever, to which the brake shoes are also attached. The vehicle is entirely controlled by this one lever, which is properly balanced and may be managed by a child.

Depressing the handle of the lever brings the motive power into contact with the two tires of the duplex driving wheel. When the handle is elevated, the power is off, and when elevated a little more the brakes are applied. A right and left movement of the same lever guides the vehicle on its course.

Mr. Barrows is making arrangements to manufacture these vehicles on a large scale. Branch showrooms will be opened in many large cities here and abroad, where the vehicles may be inspected.

Mr. Barrows' present address is Willimantic, Conn.

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From Decatur to Indianapolis by Motor Carriage.

The H. Mueller Manufacturing Co., Decatur, Ill., are members of the American Water Works Association, which holds its annual convention at Indianapolis, May 26, 27 and 28, so they have hit upon the rather novel plan of journeying in their motor carriage from Decatur to Indianapolis and placing it on exhibition during the convention.

They will leave Decatur on May 24, at 6 a. m., and expect to reach Indianapolis a little after 3 p. m. on the following day. The distance is nearly 180 miles.

On account of defects in castings furnished them they have been unable to complete their new carriage for the *Cosmopolitan* race.

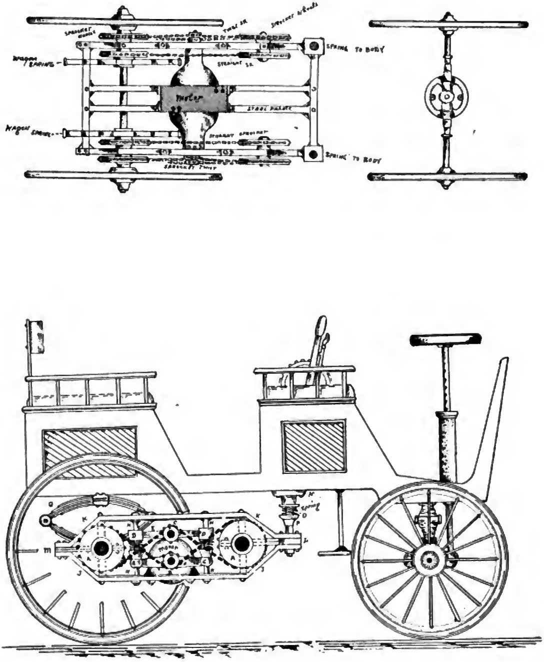
◆

The Steel Track Highway.

The O'Donnell Steel Track Company, 143 Chambers Street, New York, has been organized to put upon the market the steel track highway, invented by the Hon. John O'Donnell, of Lowville, N. Y., and illustrated and described in a recent issue of The Horseless Age.

This new form of highway has been very widely and favorably noticed by the press of the country, and is likely to come into extensive use in the near future. As it affords a splendid track for the motor vehicle, the advocates of the new method of locomotion would do well to examine into its merits.

The company have prepared an illustrated pamphlet, giving full particulars of Mr. O'Donnell's invention, which they will be pleased to send upon application.



DIAGRAMS OF WALKINS MOTOR CARRIAGE.

The Lengert Motor Business Wagon.

The Lengert Company, well known wagon builders of Twelfth and Locust Streets, Philadelphia, Pa., have entered in the *Cosmopolitan* race a motor delivery wagon, which they are making preparations to manufacture in considerable numbers.

The body of the vehicle is one of their regular styles of business wagons.

The motor is said to be built on an original plan, giving variable power from 4 horse up to 13½ horse. When once in operation it requires no attention, so that any unskilled person can operate it.

The cylinder is made of one piece of steel pipe, enclosed by a steel pipe water jacket. In the cylinder are two pistons, connected by connecting rods to a triple crank shaft.

The power is transmitted to the hind wheels by gear and chains.

By means of a special clutch speed can be regulated from 0 to 35 miles an hour.

Tests of the motor made at the Philadelphia factory of the company gave the following results:

TABLE OF RESULTS.

	1st Trial	*2d Trial*
Diameter of Cylinder................	5⅛ in.	5⅛ in.
Radius of Crank......................	2¼ in.	2¼
Number of Revolutions...	380	460
Indicated hp.........................	7.98	13.79
Brake hp (effective).................	6.67	13.01
Quantity of oil used for 1 hp 1 hour..	0.0405 gal.	0.0614

The various mechanical parts are constructed in the simplest form. The steering of the wagon is done from the front seat by a hand wheel. A second wheel under the steering wheel is for the purpose of starting the wagon and regulating the speed.

The gears are so constructed as to be noiseless, and all movable parts of the motor are counterbalanced to prevent vibration.

The temperature of the cylinder, it is claimed, does not exceed 150 degrees Fahr., and odor and noise of the exhaust are effectually done away with.

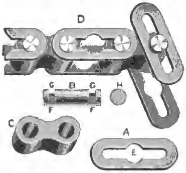
The weight of motor and gearing does not exceed 450 pounds, and as all parts of the motor are encased cleanliness is assured.

The motor can be attached to any form of vehicle without alteration, and may also be used for boats and for stationary purposes.

The Baldwin Adjustable Cycle Chains.

Many builders of motor vehicles have sought in vain for a suitable drive chain in the American market, and have finally been compelled to order from abroad. The Baldwin Adjustable Cycle Chain Co., Worcester, Mass., appreciate the need of a special chain for this purpose, and wish to call the attention of the motor trade to a new drive chain, manufactured by them, which they are confident will be found to have the necessary qualities.

The Baldwin Adjustable Chain has no bolts or nuts for connecting the ends, and the pins are secured without riveting. Each pin is turned and worked into complete shape by machinery, and is hardened. Its shape is such that, once in place, it remains there without rotating in the side plates. The pin is originally cylindrical, but is slotted out a short distance from each end so as to form a neck. This neck is cut in from three sides of a square only, one side being left intact; the side of the neck opposite the untouched part being rounded. The pin is next hardened and is ready for the chain.



In the side plates the central enlargement of the slot is large enough to let the pin pass through. Owing to the diminished area of the pin at the neck, this portion can slide into the long slots of the side plate.

Wear is claimed to be greatly diminished by this construction, and when, in course of time, the chain does become worn, it can be adjusted in a few minutes.

The Electrical Show.

The Electrical Show, which has been held the past month at Grand Central Palace, New York, in connection with the annual meeting of the Electric Light Association, while of great general interest, offered little that specially concerned the student of the motor vehicle.

The Electric Storage Battery Company, of Philadelphia, showed an "Electrobat" of Morris & Salom, and an electric launch built by the Electric Launch Company, of Morris Heights, N. Y. On account of the crowds in attendance it was found impossible to operate the "Electrobat" in the hall to any advantage.

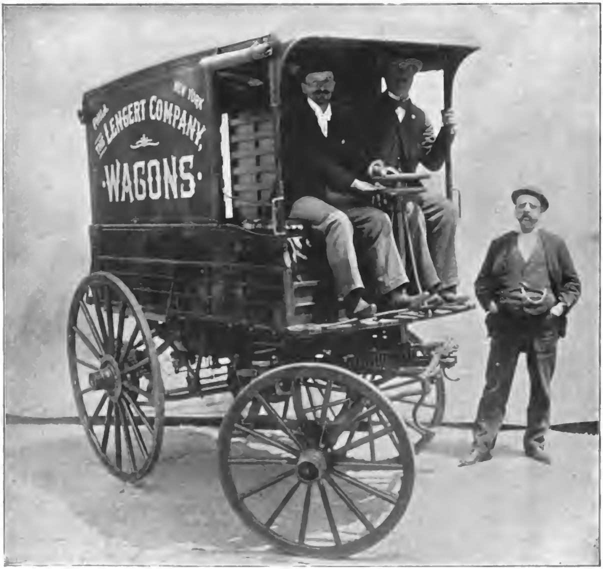
The Gordon-Burnham Battery Company, 82 West Broadway, New York, had a very tasteful booth, in which their well-known Gordon primary cells were shown. In the firm's advertising placards particular reference was made to the adaptability of this cell to gas engine and motor vehicle work. Dale, Farrell & Co., of 413 East Twenty-fifth street, New York, exhibited an electric bicycle lamp, which they are also preparing to manufacture for carriages, and a new primary battery called the "Volta," for which strong claims are made

Crookes tube and X-rays were attractive features of the primary battery exhibits, notably that of the Gordon-Burnham Battery Company.

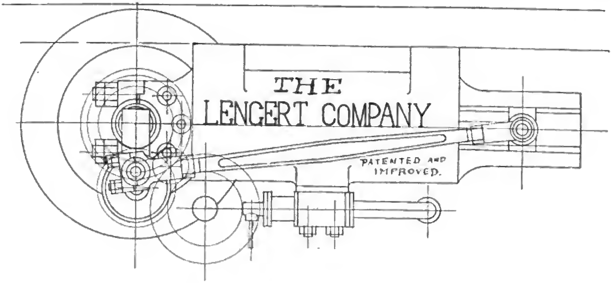
The Ball Bearing Company, Boston, Mass., showed an X-ray machine fitted with "Hub" machinery bearings, and also a wheel running on a "Hub" ball-bearing axle. James A. Morton, the company's traveling representative, was in charge of the exhibit.

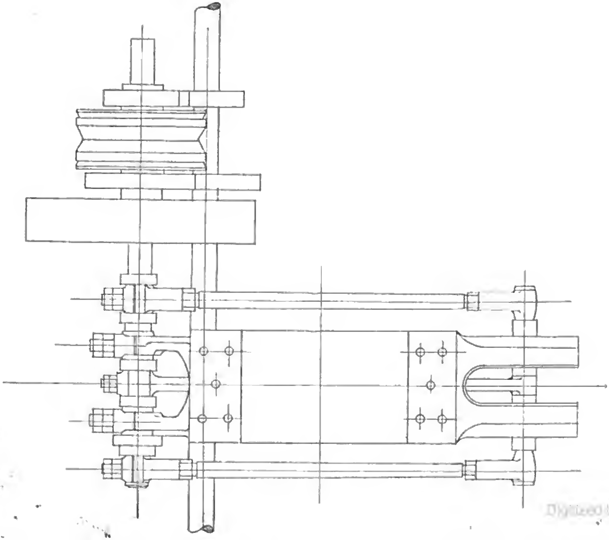
Eleven Thousand Sets of Tires in Use.

The records of the Rubber Tire Wheel Company, manufacturers of the well-known solid rubber tire, are like a name written in the sands. So rapid is the growth of their trade that the figures need constant revision. They now have over 11,000 sets of their tires in use.



MOTOR BUSINESS WAGON. THE LENGERT CO., PHILADELPHIA, PA.

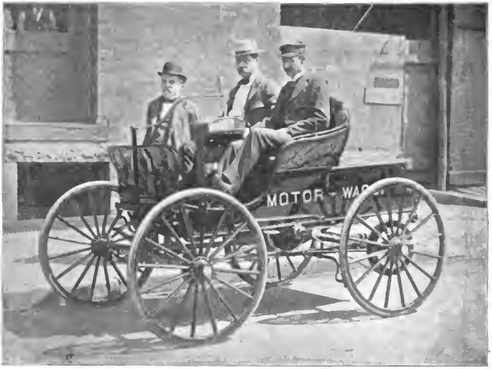

THE
LENGERT COMPANY
PATENTED AND
IMPROVED.



The Emerson & Fisher Motor Wagon.

The wagon which the Emerson & Fisher Co., of Cincinnati, O., recently constructed for Franklin Bros.' circus is modeled somewhat after the Duryea motor wagon. The motor employed is the Duryea King motor, made by Charles B. King, of Detroit, Mich , and the gearing and body is the product of the Emerson & Fisher Co.'s factory.

The Emerson & Fisher Co., are prepared to build both gasolene and electric vehicles.



MOTOR WAGON. EMERSON & FISHER CO., CINCINNATI. O.

An Australian "Automobile."

We have not heard of any Australian automobile "taking on form." There are several existing in the minds of our inventors. Mr. W. Southall, of Goulburn, who has given the public evidence of his ingenuity as a maker of vehicles, was engaged on the problem three or four years ago, when he devised a vehicle which looked tolerably promising on paper. Mr. E. E. Klap, of Sydney, has a much more perfect plan than Mr. Southall's, but up to the present he has not made even a drawing of it. He is satisfied, however, that when it materializes it will be far and away superior to any yet devised. In fact, it will do its work so satisfactorily and with so slight expense that he thinks it unlikely that it will ever be improved on. Mr. Klap has taken the idea for his automobile from the well-known toy locomotives where the spindle of a revolving fly-wheel rests on the outer circumference of the driving wheel to which its motion is imparted by friction He purposes to make his automobile on exactly the same principle. The motor (petroleum) will have a long shaft with a 4-inch friction pulley on each end. The periphery of the pulleys will be slightly concave to increase friction, but not so much as to injure the tires of the wheels, which may be either pneumatic or solid rubber; the latter will probably be used on the experimental vehicle when it comes to be made. The weight of the motor will thus be suspended from the shaft between the wheels. Provision will be made to increase the gripping power of the friction pulleys, by tension springs connected with the axle, through which any degree of pressure may be put on the wheels. The front wheels (42 inches) will be the drivers, and to the back wheels (38 inches) will be attached the steering gear, which is a most important part. It is designed so that no possible jar can be communicated to the hand from the wheels, because the movement is transmitted from the hand to the back axle by a screw, six turns of which bring the spindles of the back and front axles to line at an angle of 43 degrees, which will enable the vehicle to turn round in little more than its own length. The motor will be geared to drive the main shaft at three speeds, 900, 600 and 450 revolutions per minute, which is calculated to give the automobile a speed variable at will from 10 to either 7 or 5 miles per hour. The speed, of course, may be increased, but Mr. Klap deems 10 miles per hour sufficient to meet all reasonable requirements of traffic on common roads. Mr. Klap does not propose soon to enter upon the construction of his vehicle, because, he says, like most great inventors he is a poor man, but if he could find assistance to the extent of about £1,000 he would make an automobile to win the *Engineer* prize with, and thus provide an almost immediate and very satisfactory return to whoever finances the concern.—*Australian Coachbuilder and Saddler.*

Minor Mention.

The Kalamazoo Railroad Velocipede & Car Company, Kalamazoo, Mich., are selling quite a number of gasolene motors for propelling inspection cars.

M. H. Daley, Charles City, Ia., could not complete his motor carriage for the *Cosmopolitan* race. He expects to compete at Providence next Fall.

G. Langer, a mechanical engineer of St. Louis, Mo., has applied for patents on a gearing for motor vehicles, and is constructing a wagon employing his mechanism.

The Pierce-Crouch Engine Company, New Brighton, Pa., have about finished at their works the largest gas engine ever built in this country. Full details will appear later in these columns.

C. W. West, Halifax, N. S., hoped to complete his motor wagon for the *Cosmopolitan* race, but failed. He writes that he will be on hand at the Narragansett Park race next September.

Dr. Carlos C. Booth, Youngstown, O., is the first physician in this country to make use of a motor vehicle in his practice. For several weeks past he has been making his calls in a motor cab of his own design.

On May 9 Harry E. Dey and Thomas Brander, who are connected with the Roger American Horseless Carriage Co., of New York, ran their Roger carriage from Bridgeport to New York, a distance of about 65 miles. The carriage will remain here until after the *Cosmopolitan* race, in which it is entered.

The Portsmouth Wheel Co., Washington Court House, O., manufacturers of the "Meeker Ball-Bearing" for vehicles, are selling quite a number of their axles for motor vehicles. They have given a great deal of study to this new problem and feel that they know what is wanted

In honor of their fiftieth anniversary the publishers of the *Scientific American* offer a premium of $250 for the best essay on "The Progress of Invention During the Past Fifty Years." The length of the essay is limited to 2,500 words, and competitors are requested to sign fictitious names to their papers, sending their real names in separate sealed envelopes. All papers must be sent in by June 20.

The Atwood Manufacturing Company, Amesbury, Mass., are probably the largest manufacturers of carriage lamps in the United States. The "Atwood Driving Lamp" is particularly adapted for motor vehicles, as it will not jar out or blow out, and gives a strong, powerful light (locomotive reflector). It burns kerosene oil, and is easily detached from the dash. Every builder of motor vehicles needs them.

W. M. Webber, Parkersburg, W. Va., finds himself unable to build a vehicle for the *Cosmopolitan* race. He believes he has the proper idea of construction, having long made a study of the traction engine. The prevailing method of applying the power through the wheels he criticises as defective for sandy, muddy or frozen roads. His idea is to transmit the power direct from the machinery to the ground, which, in his opinion, will make the motor vehicle capable of any road that is passable by horses.

The American Motor Company recently made a very satisfactory test of their new portable boat-motor on Central Park lake, New York. A speed of six miles an hour was attained with an 18-foot boat containing six persons. The simplicity and manageability of the motor was made plain to all who witnessed the trial. The company have already begun to ship these motors to all parts of the country, and are taking steps to supply the extraordinary demand for them as fast as possible.

The Hartley Power Supply Company, Chicago, Ill., write that they will be unable to compete in the *Cosmopolitan* race, owing to several important changes they have been making in the model which they made for the *Times-Herald* contest. The motor as originally designed had a 1-inch bore and 5-inch stroke, but the one they are now building will have a 2-inch bore and 7-inch stroke. The wagon and other parts will be unchanged. They also state that they are applying new principles on both engine and boiler.

Henry Walker, a mechanical engineer of Kingston, Jamaica, British West Indies, has a steam carriage, which he built for his own use. He states that the servants are a great nuisance in that country, as they are impertinent, thievish and lazy to a degree. This fact alone, he thinks, would lead an English resident to purchase a motor carriage. He has a good word for American buggies, having had two in use for 13 years without finding it necessary to renew any part. If our motor wagons are as good as our buggies, he says most emphatically that they "will do."

The Columbia Pneumatic Wagon Wheel Company, Oneida, N. Y., have opened a New York office at 131 West Thirty-eighth Street, near Broadway, where they are prepared to fit their well-known pneumatic vehicle tires on wheels both old and new. In addition to the pneumatic, they also furnish excellent solid and cushion tires for those who prefer them to the pneumatic. They are applying their tires to a large number of motor vehicles, and builders who are in New York attending the *Cosmopolitan* race should call and examine their tires and facilities for applying same.

The Hyatt Roller Bearing

Some years ago John W. Hyatt, the well-known inventor in the celluloid line, undertook an exhaustive series of experiments with the object of producing a practical roller bearing. The result of these experiments was the Hyatt Roller Bearing, which from the time it was first placed on the market has been steadily gaining in favor as its merits as a friction saver become known.

The peculiar feature of the Hyatt bearing is that the rollers are both flexible and elastic, which contributes greatly to its durability and decreases the friction of the bearing. When under a load the pressure is automatically distributed over a number of rollers. On this account it is not necessary to harden the rollers and the surfaces with which they come in contact, as is the care when solid rollers are used.

Wherever thoroughly tested these rollers have fully borne out the claims of the manufacturers. They are being successfully employed in shafting of all kinds, street cars, bicycles, wagons and high speed machinery of all kinds.

Quite a number of motor inventors have adopted them for axle bearings, finding friction greatly reduced.

The Hyatt Roller Bearing Company have a factory in Newark, N. J., at 450 Market Street, and a New York office at 133 Liberty Street, where they will be pleased to see those in search of further information.

chased a large factory, which will be remodeled and occupied early in the Fall.

The editor has had quite a number of inquiries of late for wire wheels from builders of motor vehicles. He takes pleasure in referring all such to the Crawford Wheel & Gear Co., Hagerstown, Md., who have made a special study of the wire wheel for light vehicles, and have met with great success in its introduction. The same concern also manufactures tubular steel frames for light vehicles.

John W. Hall & Sons, Jacksonville, Ill, who have been experimenting with a Kane-Pennington motor for nearly a year, have abandoned this motor and ordered a motor of the Decatur Gasolene Engine Company, Decatur, Ill. This motor is said to be well adapted to the purpose, having no valves, cams, springs, levers, rock-arms, cog-gear or other similar mechanism, which may be affected by rough roads. No pump or carbureting device is used, and as there is no flow of gasolene, the motor is controlled by the electric switch, both for starting and stopping.

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Century Edition of the World French Directory.

The publishers of the World Didot-Bottin Directory, Paris, France, are about to issue their century edition. The work will comprise three volumes, and will contain between two and three million addresses of the principal mercantile firms, banks, hotels, etc., of the entire world. To firms having foreign relations it is a valuable reference. Full particulars may be obtained of the agent, Louis Renaut, 49 South Third Street, Philadelphia, Pa.

SPECIAL NOTICES.

Advertisements inserted under this heading at $2.00 an inch for each issue, payable in advance

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The U. S. patent for above engines is for sale on moderate royalty. No constant burning lamp or tube—automatic ignition—no dangerous spirit. Ordinary petroleum oil only required.

Apply BRITANNIA Co., Colchester, England.

Above is worth the notice of syndicate.

The Self-Propelling Improved Traction Engine, or Horseless Carriage.

WANTED—A party to join in the manufacture of this advanced implement for aiding the agricultural and transporting industries. Address for particulars the inventor, WILLIAM G. CLARK, No. 54 John St., New York City.

GAS and oil engine expert, with several years experience in the motor carriage business, wants permanent position. Write for particulars and address "Y. M.," care THE HORSELESS AGE.

DAVID H. MEAD.

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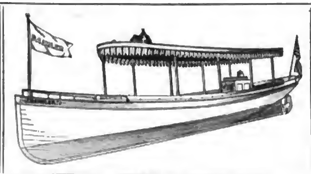
Single Screws.
Paddle and
Stern Wheels
of lightest draft.



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Driving all sorts of
Machinery,
ON LAND OR WATER.

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The Daimler Motor is the most powerful and compact, as well as reliable engine now on the market.

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Were awarded the following Prizes:

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DAIMLER MOTOR CO., - Steinway, Long Island City, N. Y.

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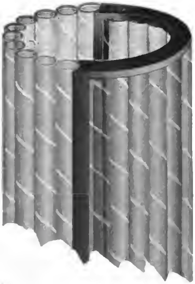
The Greatest Friction Saver of the Age.

SAVES POWER. SAVES FUEL. SAVES WEAR. SAVES OIL.



For Motor Vehicles and Machinery in General.

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Duryea Motor Wagon Company,

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MANUFACTURERS OF

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"1896 MODEL"

TRADE THE "HUB" MARK. ANTI-FRICTION BALL-BEARINGS

NO WEAR. NO CARE. NO ADJUSTMENT. NOISELESS. EASILY APPLIED.

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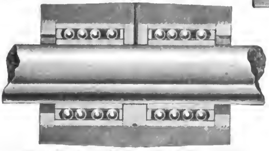
No wear on either Shaft or Box. Balls have *lateral traverse*, and roll only upon hardened steel *removable* surfaces.



Type B, or DOUBLE RADIAL BEARING.
(For heavy loads and hard service.)

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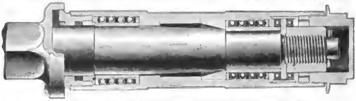
Descriptive circular with full information mailed free upon receipt of address. Correspondence solicited.

For Light and Heavy Vehicles.

Sizes, ¾, 1, 1⅛, 1¼, 1⅜ and 1½ inches. Larger sizes in process.



Patented Aug. 19, 1890; April 7, 1891; Jan. 5, 1892; and July 11, 1893.

The only Ball-Bearing on the market supporting the following claims

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2.—SEPARATE SETS OF BALLS to take the load and the "end thrust."

3.—The balls CONFINED IN CAGES, enabling them to be handled as ONE PIECE.

4.—Requiring ABSOLUTELY NO ADJUSTMENT.

THE BALL-BEARING COMPANY,
Main Office, The Hancock Inspirator Co.'s Building,
Watson St., near Northampton, *BOSTON, MASS.*

Please mention "Horseless Age."

THE HORSELESS AGE.

A MONTHLY JOURNAL

DEVOTED TO MOTOR INTERESTS.

VOL. I. NEW YORK, JULY, 1896. No. 9.

THE HORSELESS AGE.

E. P. INGERSOLL, Editor.

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The Providence Race.

The rules of the Providence race, just announced in this issue, have provoked considerable criticism. It is argued that the entrance fee of $100 will bar out many poor inventors, who would otherwise be able to compete; that the rule requiring a rate of speed of at least 15 miles an hour is onerous, and that the entries should not be closed so early as Aug. 10.

The promoters of the race doubtless wish to avoid the large promise and small fulfillment which have characterized both the races previously held here, and prefer to reduce the entries, so far as possible, to responsible and reliable parties, who may be depended upon to make every effort to be present. It must be confessed that there is some reason for this view, though, on further reflection, the chances of a good showing are decidedly in favor of a free entry. The majority of inventors are poor, and the cost of experimental work is heavy enough without adding any incidentals at this incipient stage of the industry. This provision is sure to have a discouraging effect.

In considering the speed limit it must be remembered that one part of the programme is a race and the other an exhibition. A race without speed lacks public interest, and a speed of 15 miles an hour is not excessive on a race track. A contestant who enters a racing machine so unsteady that it will not stand up to this speed on a curved track deserves bruises rather than prizes, and will probably get the former.

Liability of accident cannot be wholly eliminated from racing, but it is not customary to award the victory to those who are unfortunate enough to meet with mishap. In this respect all contestants appear to stand on a par, and if a vehicle of first-class merit fails in the race it may redeem itself in the exhibition, where other points of more practical importance than speed are to be considered.

The clause to which we can most emphatically take exception is that requiring entry not later than Aug. 10. This is too early to close the entries. Many will not know until about Sept. 1 whether they will be able to compete. If the time is extended some of these doubtful ones will respond, and the list of entries and starters will surely be longer. As all interested are desirous of seeing this list as large as possible it is to be hoped the management will reconsider this matter, and decide to give more time.

The present entries are only an earnest of what may be expected by September 1st.

Thomas Kane's Explanation.

On another page of this issue will be found a rather lengthy statement from Thomas Kane, of Thomas Kane & Co., Chicago, builders of the Kane-Pennington engines and motor vehicles, to which editorial reference was made in the last issue of The Horseless Age.

This statement, in its entirety, will be read with interest by the motor trade of America, but the most interesting part of it will undoubtedly be that wherein Mr. Kane still affirms his belief in the double-spark invention of E. J. Pennington, announcing it as the chief feature of the new "Victor" Pennington engine, into an advertisement of which his explanation is finally seen to resolve itself.

In a pamphlet just issued by this firm to extol the merits of the "Victor" engine occurs the following paragraph descriptive of the marvels of the double spark:

> The obtaining of the double spark, the first spark before final compression and the second immediately after, is the invention of Mr. E. J. Pennington. Its first application was to fluid engines, where the oil is admitted directly into the cylinder, its volatilization being completed by the first spark and the thus ripened mixture exploded by the second spark. The results obtained, especially in thin cylinder engines, are simply wonderful. This invention applied to the thin engine will undoubtedly supplant all others for vehicle purposes, as in addition to the light weight and the thin cylinder, the action of the preliminary or volatilizing spark cools the cylinder to such an extent that only a very little water is required for cooling purposes. For vehicles this is of vital importance. This type is known as the "Kane-Pennington" engine. In stationary engines thin cylinders are not essential, as a certain amount of weight is an absolute necessity. It is also necessary that they be equally adapted to the use of natural gas, ordinary illuminating gas, kerosene or gasolene, as desired. These facts led to a series of experiments, the very gratifying results of which are embodied in the new Victor engine. They are: First, ease of starting; second, absolnte certainty of explosion, and, third, greatly increased power.

It requires no electrician or expert in gas engines to detect an absurdity here. It is admitted that the second spark is hot, because it is said to fire the charge, and only heat will do this, but we are confronted with the singular assertion that the first spark "cools the cylinder" and "ripens the mixture." How can it be possible from the same battery and electrical outfit, almost simultaneously to produce two sparks, one of which is cold and the other hot? And if the first spark is also hot, like the second, how can it "cool the cylinder?"

An electric spark will ignite a mixture of gas and air if the proportions are correct, and if these are not correct, it will have no effect. Any gas engine maker who knows the A B C's of his business can produce two or more sparks in the cylinder, if he wishes to waste his battery. But half a dozen sparks are no better than one, for it takes one good spark and only one to ignite the charge.

What is meant by "ripening the mixture?" If the mixture is not ripe for ignition, what possible effect can the spark have upon it?

This is probably the ripest mixture of nonsense that motor literature so far affords.

Now For the Flying Machine.

The flying machine is developing side by side with the motor wagon. Scores of able inventors have devoted years of careful study to the problem of balancing in mid air and making headway against the wind. From recent reports their efforts seemed to have been crowned with success, and this difficulty having been overcome we may soon expect to see motor flying machines capable of carrying a man through the air at a high rate of speed, and with reasonable safety.

Most persons who are interested in aeronautics are following very closely the development of the motor vehicle, because they are, as a rule, progressive thinkers, and, more particularly, because they feel confident that this great movement for improved terrestial locomotion will produce a light motor that will be available for aerial locomotion also.

The award of the full *Cosmopolitan* prize of $3,000 to the Duryea Motor Wagon Co. is quite in accordance with the facts, no other vehicle having fulfilled the conditions laid down by the promotor of the race.

Recent reports from Paris indicate that French engineers are improving greatly on present models of motor vehicles. By the time the Paris-Marseilles race is run quite a number of new ideas will be in evidence. There, as here, many are struggling after the elusive rotary motor, which, it is generally admitted, is the *summum bonum* in this line.

JOIN.... **The American Motor League.**

A Glimpse Futureward.

BY CHAS. E. DURYEA.

It is interesting, to many people, to look back over the past and see what has been accomplished in the years that have gone by: the battles that have been fought, the victories that have been won, or lost, the struggles and trials gone through, the successes accomplished or the failures recorded—these are all interesting to the student of history, and the pages of history, although in many cases not so bright as we would like to see them, are both pleasant and instructive; but for pure, unadulterated pleasure, the pages of history are not to be compared with the pictures of air castles which may with reason be drawn, and which we may hope to see in the very near future.

We look backward over the century and trace the development of steam power in its effect upon civilization, and the picture is bright indeed. During that same century repeated attempts have been made to apply that same magnificent power, which has done so much in other lines, to the propulsion of vehicles upon the common highways of the land. Time after time this attempt has been made only to record a more or less complete failure, until less than a third of a century ago adverse legislation in England stopped attempts there and left the question awaiting development in other lands.

America has had much work to do in many lines, and has not the good roads found in Europe, so that this question was not taken up in the United States until the last decade. France, however, possessing splendid roads, saw the advantages to result from automobile vehicles, and pushed forward. The application of steam was first tried, with fair success, and to-day we see abroad two styles of steam vehicles giving very good satisfaction.

A little later the application of hydro-carbon to an internal combustion engine, commonly called a gas engine, was made with success, and to-day it bids fair to be the power of the future for this purpose. Within the last year or so America has come to the front in this matter and, making a virtue of necessity, has produced machines of sufficient power and of such light weight as to be able to surmount the difficulties found in her imperfect roads. These very difficulties made it necessary to produce superior vehicles and for this reason the highest examples of the automobile vehicles are found on this side of the water.

So thoroughly is this recognized that in an advertisement lately circulated by the Imperial Institute management of London, Eng., there appeared four types of vehicles, of which three were American.

This development of a new or nearly new application of heat to the production of energy is destined to play almost as important a part in the history of civilization of the future as the application of heat in the form of the steam engine has played in the past. While the heavier work may be satisfactorily done by the steam engine, it will be found that a smaller and lighter gas engine will serve better in lighter work in the future.

For example, where the tendency in the past has been to concentrate factories in one place so as to use single sources of power, the advent of the light, cheap, powerful motor will permit them to scatter into the smaller towns and so counteract the prevailing tendency of the large towns to grow larger at the expense of the smaller ones.

But the greatest effect on civilization will be found in the many uses for light motors. Motor vehicles require a very high power in very light weight. They require that the engine should be free from noise, vibration, odor, and that it should not require much attention. Such a motor will be found useful in almost every household and in every shop of every kind for all classes of work.

Such a motor is easily moveable and can be taken from one job to the next without difficulty. Farmers will find it in many places far more convenient than animal power, and housekeepers will use it in many places where muscular power now is used.

In the application to vehicles alone it will be widely beneficial. Bicycles of all sizes will be equipped with it. Small, light-weight boats will be driven by it at high speeds, and there is no reason why our many streams and bodies of water should not become as popular pleasure resorts as the bicycle has made our common roads. Tricycles, carriages—both large and small—will be nicely adapted to the needs of everybody, and in a few years their prices will likewise be suited to the buyer's purse.

The experiments of such men as Maxim, Langley, Chanute and others no less prominent, but not so well known in America, assure us that ere many months we shall be able by the application of this light motive means to travel through the air at high speeds and with an amount of pleasure not before experienced in any means of locomotion.

The motor vehicle is the incentive which has caused inventors to study the light motor problem, and therefore it is directly the cause of this step forward in the application of mechanical power, and it is well that inventors should be shown that their motors are applicable to other uses outside of the motor vehicle use. There is an enormous market to be filled, and there is no reason why many forms of motors cannot be successfully used in filling this market.

The writer wishes success to all who may enter this field and predicts a glorious future for those who succeed in producing motors which meet the requirements.

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The Carriage Motor.

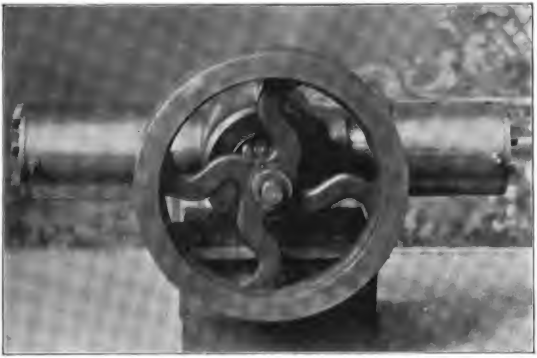
BY M. H. DALEY.

During the past year many inventors have been at work on the problem of a practical carriage motor, and thousands of dollars have been expended in experiments that failed to produce the desired result. Yet these efforts have not been expended in vain. Through them inventors and the public have been educated, and the day of the perfect motor brought nearer.

I have said that the carriage motor must be light, strong, durable and so simple that an inexperienced person can use it. It must be like the watch, positive in its movement, and as little likely to get out of order.

Thinking that perhaps a few illustrations of unsatisfactory results would be of interest, I send you photos of three different motors which I have built, the last of which is yet unfinished, but which seems better suited to accomplish the results aimed at than the others.

Fig. 1 is a rotary double motor, designed to take the gas mixture by pumping air into each rotary compartment, the air being drawn through vaporizers on each side of the motor, into which vaporizers gasolene is pumped. The vaporization of the gasolene is designed to absorb a portion of the heat from



THE DALEY MOTOR. M. H. DALEY, CHARLES CITY, IOWA.

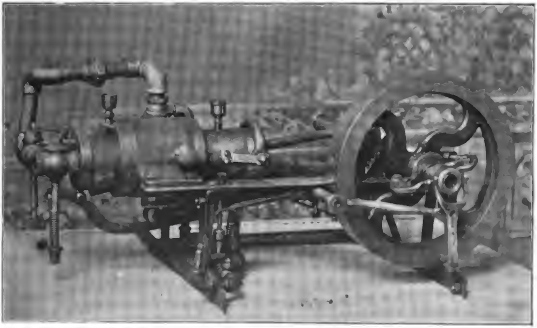
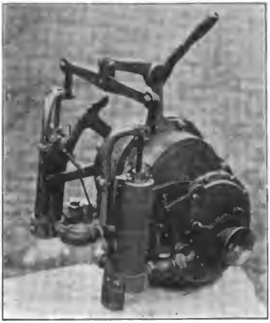


FIG. 3.—SINGLE CYLINDER MOTOR. M. H. DALEY, CHARLES CITY, IOWA.

the motor and thus aid the water jacket in cooling the same. The length of stroke of the pump and time of explosion are designed to regulate the power of the motor, as any quantity, from nothing to the full length of the cylinder, of gas mixture can be forced into the motor, the explosion taking place late in proportion as the quantity is increased.

The inside working part consists of an eccentric wheel, one side of which fits air-tight against the outside case, and revolving around in the case by means of spring packing, forms the moving piston. A valve works in and out, following this eccentric in its revolution, and takes the back pressure the same as the head of a cylinder. The space on the loose or open side of the eccentric being 2 inches, and the width of the wheel 2 inches, I obtained a cylinder the form of a new moon, 2 inches square at the centre and terminating 2 x 0 at each end.

The gas mixture is compressed in the pump cylinders, let in after the rotary piston has passed the opening and fired just as the pump piston reaches the bottom of the pump cylinder. The length of the stroke of the pump at the time of firing is regulated by raising or lowering the centre of the equalizing bar that crosses from one pump to the other. When one pump is forced down it raises the other up. This motor was designed to give two explosions each revolution, and to work without balance wheels. The explosions were obtained by electric spark. But it failed to give any power, although exploded twice every revolution when turned by hand or power. I therefore laid it aside, after having it examined by experts, who could not give any reason why it would not work.



ROTARY MOTOR. M. H. DALEY, CHARLES CITY, IOWA.

Of the next motor I have no illustration. It was a single-cylinder motor, designed to regulate the power by shortening or lengthening the stroke of the piston. It developed great power, so much, in fact, that the frame and mechanism proved too light. I abandoned it as impracticable.

The third motor (Fig 3) was a single-cylinder four-cycle ordinary steel cylinder motor. This motor ran nicely at 600 revolutions, but gave such great vibration or "kick" at each explosion that it would lift the front wheels of the carriage two inches off the ground.

The fourth motor, the "Eureka," is a single-cylinder, double crank motor, the piston moving one way and the cylinder the other. The cylinder is 3¼ inches by 12 inches. The cranks are 1½ inch, giving the cylinder 3 inches stroke in one direction and the piston 3 inches stroke in the opposite direction, and making a 6-inch stroke designed to run at 300 revolutions per minute.

The gasolene is pumped into the vaporizer alongside of the water jacket, through which the cylinder passes back and forth. A loose-jointed pipe connects this vaporizer with the inlet valve. The exhaust is accomplished by pressing a roller against a moving lever, that opens the exhaust valve similar to the valve of a steam whistle.

This motor did not prove satisfactory for several reasons, the principal of which was that it was too complicated and offered too much friction. But it did away with vibration.

The fifth motor, which we will call "the Daley motor," is a very neat, compact, double-cylinder motor. Both cylinders are designed to be exploded at the same instant to avoid vibration. The centre case forms the base on which it rests, and encloses the double cranks and connecting rods, which are designed to dip in oil held in the bottom of this case, which will throw the oil into both cylinders and oil all working parts, while no oil can spatter outside. The only working part outside is a rock shaft that opens both exhausts. This rock shaft is driven by a simple cross cam that gives the shaft one impulse each way every second revolution. Two poppet valves are used for each cylinder. The vaporizer is screwed into the inlet valve.

The gasolene may be pumped in the vaporizers or let in through a needle valve, the tank holding the gasolene having an air pressure of two or three pounds to force the oil out. Explosion is accomplished by an electric spark, the current being broken by the end of the pistons striking a short lever inside the cylinders. Connection of the electrode is obtained by a spring outside. The valves or rock shaft do not show in this illustration. This motor is designed to make 600 revolutions per minute, speed being governed by a governor in one of the balance wheels, the same as in the "Eureka."

There are two balance wheels weighing about 25 pounds each. The cylinders and water jackets are made of steel and are screwed into the cast centre base. The cylinders are 3¼ inches, the length of stroke is 3 inches, estimated horse-power 2½ and weight 100 pounds.

The simplicity of this motor, with the advantage of no vibration and the small space required, seems to make its success assured. Its total length is 24 inches, width without balance wheel 10 inches, with balance wheel 14 inches. The diameter of the balance wheel is 17 inches. This motor is not yet completed. I will give results as soon as a test has been made after its completion.

The expense of these experiments has been considerable, yet I am determined to keep at it until I get what I consider a practical motor for carriages.

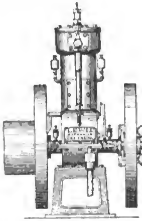
* * *

The Daimler Motor Co., Steinway, L. I., have entered in the Providence race.

The Lewis Expansion Gas Engine.

George W. Lewis, inventor of the Lewis Gas Engine, Chicago, Ill., is bringing out a new engine called the "Lewis Expansion Gas Engine," involving an entirely new principle.

The Otto type of gas engine draws in the charge on the second stroke of the piston, when the cylinder is filled with gas and air, on the return stroke compresses the charge, and at the limit of the instroke ignites the charge. The expansive force of the burning gases drives the piston to the limit of the outstroke and passes out through the exhaust pipe. The expansive force of these burning gases, when passing out through the exhaust pipe, is seldom less than 30 pounds to the square inch, and often more.



It costs something to produce this 30 pounds to the square inch, and it is all blown out through the exhaust pipe and wasted. This means that from 20 to 30 per cent. of the expansive force of the gases is lost, and in the operation of the engine brings nothing in return.

Also in this type of engine there must of necessity be very heavy fly-wheels, in order to make a tolerably steady motion. These extra heavy fly-wheels cause extra friction, and this extra friction must be overcome by extra power, which is also a loss to the owner of such an engine.

Both sources of waste are claimed to be avoided in the Lewis expansion gas engine, which may be made to exhaust at atmospheric pressure, and thus utilizes all the expansive force in the gases, and entirely does away with the noise of the exhaust.

Ignition is by electric spark or hot tube, as desired, and either gas or gasolene may be used for fuel.

Very little water is required for cooling, and the speed may be throttled down like that of a steam engine.

Mr. Lewis is adapting this new engine to vehicles—a factory having been opened at 153 and 155 Jackson Boulevard under the name of the Lewis Moto-cycle Works.

Electric Carriages For Niagara Falls.

At Niagara Falls a project is being agitated to build a 200-foot boulevard between that city and North Tonawanda, N. Y., a distance of 11 miles, and have thereon, besides a speedway, an all-steel road, on which might be run electric carriages operated by power from the Falls.

Gen. Roy Stone, chief engineer of the Department of Road Inquiry at Washington, is said to strongly favor the idea, as he believes that the solution of the good roads problem lies in the steel track highway.

The Niagara Power Company would furnish the current to charge the storage batteries.

Progress on the Eisenhuth Wagon.

John W. Eisenhuth, the San Francisco inventor who is now building a motor wagon at the shop of Stucky & Heck, 33 N. J. R. R. Avenue, Newark, N. J., has nearly completed his labors.

He has made a special study of the electrode, and believes the success of a gas engine depends largely on the reliability of this mechanism. He has just been allowed a patent on one electrode and has applied for a patent on another which is adjusted automatically by a cam on the valve shaft, so that all wear is readily taken up without the necessity of touching any parts in the compression chamber.

As soon as the charge is fired every part of the electrode stands still, thus saving wear and battery as well.

The view of the motor which we show on the opposite page will give the reader an idea of the great power which will be available for driving this wagon, each of the four cylinders being estimated at from five to seven horse-power.

Haynes & Apperson at Work on a New Model.

Haynes & Apperson, Kokomo, Ind., write that they are building a new carriage which they expect will be considerably in advance of their previous models.

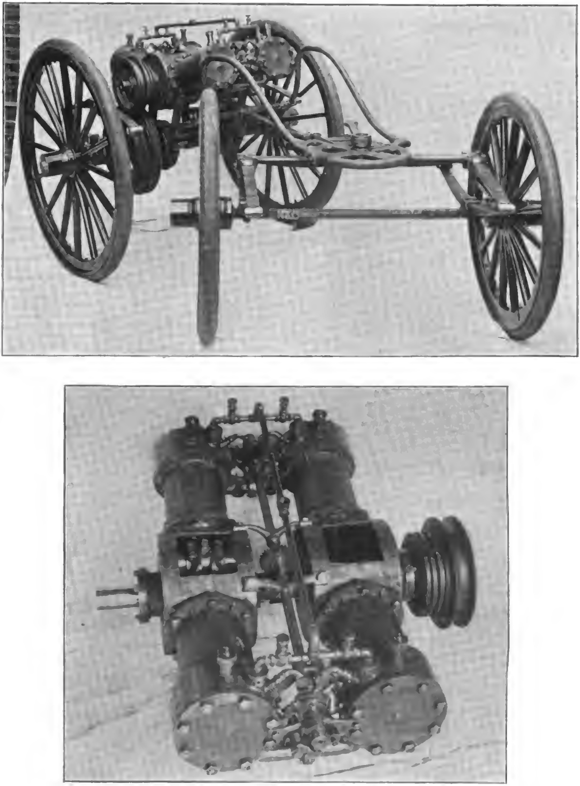
With the exception of the cylinders, which are of steel tubing, all parts of the motor are made of aluminum, as was also true of the motor this firm entered in the *Times-Herald* contest last Fall. Their experience, they state, has demonstrated the superiority of aluminum over cast iron in carriage motors, a truth which they claim to have been the first to discover.

The motor traps entered at Chicago had a maximum speed of 18 miles an hour on a good, level road and averaged about 12 miles an hour on ordinary country road. They expect that the new vehicle will make an average of 14 miles an hour on good, level road.

Haynes & Apperson will have three carriages on exhibition at the fair to be held at Columbus, O., in September, and if they can leave Columbus in time they intend to ship one to Providence to compete for prizes there.

◆

The *Scientific American*, of New York, has signalized its 50th anniversary by the publication of a very handsome 72-page special number, which consists of a review of the development of science and the industrial arts in the United States during the past 50 years. It was an ambitious undertaking, and the work has been well done. The many articles are thoroughly technical, and they are written in a racy and popular style, which makes the whole volume—it is nothing less, being equal to a book of 432 ordinary pages—thoroughly readable. It is enclosed for preservation in a handsome cover, and is sold at the price of ten cents.



EISENHUTH WAGON AND MOTOR.

The New Empire Motor.

The Empire Motor Co., Pittsburg, Pa., are building two wagons for the Providence race, each to be equipped with a new motor, of which we are enabled to give our readers an illustration in this issue.

This new Empire motor has two cylinders, with a light copper jacket brazed on.

At the base of the cylinders and partly separated is a reservoir or tank that holds 1½ gallons of water.

In this tank are two felt brushes which encircle the cylinder, and by means of a worm wheel are made to move up and down the length of the cylinders, and so distribute the water at every six revolutions.

This keeps the water from direct contact with the heated cylinders so that one supply will last for hours without heating above 90 degrees.

There is only one valve on each cylinder which is used for both receiving and exhausting the gases. The valves are cast in one piece with the motor and are located between the cylinders. They are controlled by one cam-wheel located on the shaft between the cranks. This wheel is encircled by a double track, which tracks cross each other at a point, causing the cam to be shifted from one side to the other alternately, and lifting the valve stems at the same time. This does away with the noise of gear wheels.

The governor is located between the motor and the supply valve and is so arranged that a charge is taken very time, but is regulated proportionally to the load carried. The automatic igniters of the Gardner Motor Co., New Orleans, are exclusively used.

The weight of the 5-hp carriage motor is 168 pounds in all, dimensions 10 x 17 x 15½ inches. No fly-wheel is used, a large steel disc on the wagon shaft or axle for speed changing taking its place.

The Empire Co. are turning out two stationary engines for electric lighting, one of which they claim has run direct to a Westinghouse dynamo without any countershaft, and given a light as steady as can be made with steam, which speaks well for the governor.

The vehicles for the Providence race will probably be a trap and a light delivery wagon.

The Empire Co. have orders enough ahead to keep them busy for six months, and are prepared to supply 5-hp carriage motors of the above improved pattern.

◆

List of French Motor-Vehicle Builders.

We clip from a foreign contemporary the following list of motor-vehicle builders in France, 16 in all :

Compagnie Générale des Automobiles, 2 Rue de Complègne, Paris
Decauville-Serpollet, 13 Boulevard Malesherbes, Paris.
Delahaye, 34 Rue du Gazomètre, Tours.
De Dion et Bouton, 12 Rue Ernest, Puteaux (Seine).
P. Gautier, 56 Boulevard Arago, Paris.
Société des chaudières et voitures à vapeur, système Scotte, 56 Rue de Provence, Paris, Paris.
Landry et Beyroux, 19 Rue Albouy, Paris.
Maurice Le Blant, 10 Avenue de'l Opéra, Paris.
Léon Lefebvre, 4, Rue Commines, Paris.
Panhard et Levassor, 19, Avenue d' Ivry, Paris.
Peugeot frères, à Mandeure (Doubs).
Richard, 110, Rue d'Angoulême, Paris.
Rochet et Schneider, 202, Rue Paul-Bert, Lyon.
Roger, 52, Rue des Dames, Paris.
E. Rossel, 82, Rue des Sarrazins, à Lille.
H. Tenting, 46, Rue de Ponthieu, Paris.

This list is said to be complete, but Jeantaud and Clement are not found in it, nor the Gladiator Co., who are surely deep enough in the new business to be entitled to enumeration.

◆

Can't Go Through This Town.

The authorities of the town of Greenwich, Conn., have taken a stand against the motor carriage. Several carriages which passed through there lately frightened the staid old country plugs of Greenwich to such an extent that the prosecuting attorney interfered and forbade the operators from again venturing within the town limits.

◆

The Duryea Company Get the Prize.

The entire amount of the prize money—$3,000—offered by John Brisben Walker, editor of the *Cosmopolitan Magazine*, for the race of May 30, has been awarded to the Duryea Motor Wagon Company, of Springfield, Mass., whose wagons alone went over the prescribed course.

The Sheffield Motor Velocipede Car.

The Sheffield Car Co., Three Rivers, Mich., are now placing upon the market a motor velocipede car for the use of road masters, track inspectors, telegraph constructors and repairers, etc.

The description we take from the *Scientific American*.

"While the car is light, the weight being under 250 pounds, it is exceedingly powerful, the motor being amply strong to carry a load of two men up any ordinary grade, and will run at a speed of 15 to 20 miles per hour. This, however, is not the limit of speed, as it can easily be run faster than is safe for so light a car.

"The engine is a double one and has cylinders of proper size, fitted with trunk pistons, and is so arranged that an impulse or propelling movement is given the axle at every revolution. This impulse comes from the explosion of the proper mixture of air and gasolene vapor in the cylinders by an electric spark.

"The gasolene is carried in a sealed copper reservoir, which will contain enough to run 75 miles of average road, though, of course, the conditions of grade or strong head winds may make it necessary to replenish sooner, a supply being carried in an additional reservoir for the purpose. Proper mechanism regulates both the admission of gasolene and air to the cylinders, so that the proportion of each can be varied, which is important, and the device is therefore so constructed that the operator can see exactly how much of each is being used, and can control them separately by suitable levers within convenient reach.

"The spark is supplied by hermetically sealed chemical batteries and increased by suitable developing coil. A hand switch makes the connection, closing the circuit at will. The mechanism operating the sparking or contact points is exceedingly simple, and made of case-hardened steel.

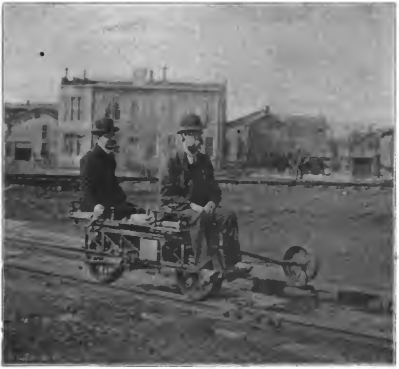
"It is therefore hardly possible for it to get out of order and the wear on these parts will be very slight.

"In starting, gasolene is turned on, the air valve is opened and the switch closed. It is necessary to run with the car a few steps to get it under motion, when the mechanism becomes automatic and the operator, stepping aboard, has only to regulate the proper amount of gasolene and air to bring the speed to any desired point. The valve and other mechanism is carried directly upon the cylinders, thus making the engines and their parts self-contained, which is quite important in point of wear.

"The leading and driving wheels are equipped with the Sheffield concave steel tires, which constantly tend to hold the car upon the track, even at high speed, although it should always be remembered that there is comparatively little weight to hold the car down, and it is therefore not advisable to run, the car at the top of its speed at any time. All wheels have forged steel hubs, wood centres and steel tires."

Octave Chanute's Flying Machine.

Octave Chanute, of Chicago, formerly president of the American Society of Civil Engineers, has been a diligent student of the flying machine problem for several years. He recently made a test of an experimental model illustrating the



MOTOR VELOCIPEDE CAR. SHEFFIELD CAR CO., THREE RIVERS, MICH.

principle of balance or safety in flight which he has been engaged in elaborating. The test was made in Indiana among the sand hills on the shore of Lake Michigan, and is reported to have been entirely satisfactory to Mr. Chanute and his assistants.

He will now proceed to build a larger machine, propelled by a motor of his own invention.

This motor will probably also be rendered available for the propulsion of wagons.

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A New Flying Machine.

We reproduce on the same page a photograph showing a model of a flying machine now being constructed by W. F. Brinton, Washington, Ia. The model is eight feet in length and three feet wide, and upon these lines the inventor is building a large machine to be propelled by a motor.

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Louis Lockert, engineer, of Paris, is writing a treatise on "Automobile vehicles," which is being published serially. Two chapters on Velocipedes and Steam Vehicles have already appeared, and two others are in preparation on Petroleum and Electric Vehicles.

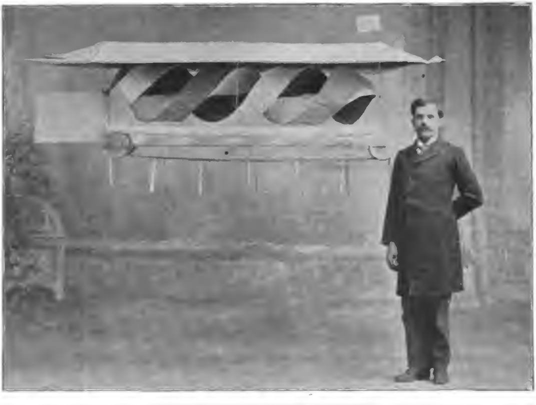
◆

H. C. Baker, of Hartford, Conn., who has been studying the motor question for six years, was recently granted a patent on a gas engine.

Primary Batteries for Sparking Purposes.

Every manufacturer of motor carriages has been confronted sooner or later with the problem of a primary battery for the purpose of sparking gas in the motor. The market is full of good, bad and indifferent primary batteries, ranging in price from 30 cents to $3, and even higher. It is a noteworthy fact that none of the manufacturers, with a single exception, are willing to guarantee efficient action on the part of their product, and we can scarcely blame them for taking this stand, inasmuch as there are so many possibilities for error to creep in in the construction of the cell. A slight variance in the grade of material used, and improper distribution of the same, or a false connection will, in many cases, produce a ground and kill the cell. The shaking up which a cell gets in a moving vehicle adds materially to the danger of displacement and the making of false contacts. To overcome these difficulties inventors have tried various methods, until at last the Gordon-Burnham Battery Company placed upon the market their steel cell, prepared purposely for this work.

The elements in this cell are so arranged that, no matter how severely the jar is used, it is impossible to make a contact that will produce local action. No acid is used, hence a metal cell is possible, and to make the cell water tight, they are manufacturing a steel jar, fitted with a compressed fibre cover. The weight of the elements rests upon the cover, being suspended from it by a rod; thus it takes the position of a pendulum, except that there is no possibility of vibration, all the parts being rigidly connected thereto. The solution, which



W. F. BRINTON AND HIS FLYING MACHINE MODEL.

consists of water and an electro-sodium, specially prepared by the manufacturers, is covered with a coating of light parafine oil.

In order to secure satisfactory results every item of material which goes into the construction of the cell is made of the very best that the market affords. The jar itself is of the finest Bessemer steel; the insulation on the wire is Okonite; the tinned perforated insulation in which the copper element rests is made of sheet steel and tinned after being perforated. The other tin used is extra heavy, first-class block tin. The zinc is the very best to be obtained, and is guaranteed by the manufacturers to run 99$\frac{9}{10}$ pure metal. This is necessary, inasmuch as the zinc cylinder is cut from sheet or rolled zinc. The copper element is manufactured by the company, and every pound is thoroughly inspected before being put up. This makes the battery expensive in cost of manufacture, but it gives an article which the company is able to guarantee in every particular. When once properly installed the user may be sure that it will carry him through and not leave him 20 or 30 miles away from his source of supplies without means of return. An examination of the zinc by lifting it from the solution shows at a glance how much energy remains in the cell and how much longer the charge will last.

The No. 1 cell, which occupies a space of 6 x 9 inches, is guaranteed to give 250 watt hours. On short circuit work it has an E. M. F. of from .65 to .75 volt, and can deliver a constant current of 6 to 8 amperes. Under this production the cell cannot be polarized, as there is practically no internal resistance, this item being not over .04 of an ohm—and no local action, all of the energy produced becomes available.

This cell has been tested on parlor cars, motor carriages and launches, and has invariably been successful.

The Sintz Gas Engine Co., the Monitor Vapor Engine & Power Co., the Truscott Boat Manufacturing Co., the Hydro-Carbon Launch Co. and numerous other gas engine companies use nothing but this cell.

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The Auriol Rotary Motor.

Paul Auriol, a Parisian inventor, is constructing a motor carriage, propelled by a new rotary motor, of which our contemporary, *La Locomotion Automobile*, gives us just enough details to arouse our curiosity. Though a rotary motor, we are informed that it has pistons and cylinders. It has no valves or pumps, cooling of the cylinders is effected by rotation, and vibration is wholly avoided. In addition to these remarkable advantages the motor is said to be simple, compact and light.

M. Auriol has already organized a company to exploit his invention, and is taking out patents in all foreign countries.

◆

"Power Locomotion on the Highway."

Rhys Jenkins, M. I. Mech. E., London, England, is about to issue a work entitled, "Power Locomotion on the Highway," which is intended to be a guide to the literature relating to traction engines, steam road rollers and mechanically propelled carriages and other vehicles. The publishers are Wm. Cate, Ltd., 32 Bouverie Street, London, E. C., and the price is 2s. 6d., net, postage free.

COMMUNICATIONS.

A Statement from Thomas Kane.

CHICAGO, ILL., July 16, 1896.

Editor Horseless Age.

My attention has just been called to an article in the June number of the AGE which does me a very grave injustice. Will you kindly allow me space for a brief explanation?

For 10 years or more we have been manufacturers of vapor engines. We regarded our type of engines as equal to any in the market, but we were not satisfied. We were looking for a better engine, or rather a better principle, when the Pennington invention was brought to our attention.

After very thorough examination and testing by experts I became satisfied that the inventor had practically entered a new field, and that his inventions had some very decided and valuable advantages over anything yet produced. We arranged with Mr. Pennington to manufacture engines only, it being stipulated in writing that we were not to engage in the manufacture of vehicles of any description, that being out of our line.

Our factory was only fitted for the manufacture of engines with cast-iron cylinders. We put in special machinery to make thin cylinders, but were not fairly started when the engine shops were partially destroyed by fire. The destruction included the patterns and special machinery.

In the mean time patents had been applied for in a number of foreign countries and an option given on the English patent by the terms of which an expert must go to England and exhibit vehicles embodying the new invention. Mr. Pennington went to England for this purpose and has not yet returned. The destruction of our shops by fire occurred March 2 of the current year. A very few of the engines shipped out previous to that time were not quite perfect. This is not surprising in view of the fact that the inventions, the style of engine, the tools and machinery, were all new and special. Our workmen also were unaccustomed to this special class of work. Whenever complaints were received and purchasers desired to return the engines, we took them back, as has been our life-time business policy to warrant everything we sell.

Meanwhile, from the start, I had had great faith that the inventions would be just as applicable and just as valuable when applied to gas engines of the ordinary cast-iron cylinder type as when applied to thin cylinders for vehicle purposes. We built and had been running for perhaps 30 days one engine of this type, embodying the Pennington inventions, when the fire occurred. As soon as the factory was rebuilt we resumed this branch of the business, deferring the manufacture of thin cylinder engines for vehicle purposes until Mr. Pennington's return.

Herewith I hand you a full descriptive circular of the new engine, which we call the *Victor*. This circular is preliminary to a catalogue which is now in preparation. You see what we claim for it. I am not a practical machinist or an expert, but my 10 years' experience in the manufacture and sale of gas engines ought to be of some value. As stated before, we have always regarded our engines as fully equal to any in the market. The cylinders of our former and of our present engine listed as 3 horse-power are exactly of the same size and capacity. Under the most favorable circumstances we were never able to obtain more than $2\frac{1}{4}$ horse-power steady running out of the old engine. The present engine with the Pennington improvements and inventions pulls steadily right along, day after day, 40 electric lights, and will carry 50 with more apparent ease than the old engine carried 30. In fact, we were never able to depend upon its carrying more than 25 successfully.

This means that we obtain from the new Victor from 75 to 100 per cent. more power than we were ever able to get out of the old style engine, both being of the same size and cylinder capacity. No more fuel is used now than before, and the construction of the engine is certainly more simple and easily understood.

Now there is no possible way of accounting for this remarkable showing except by conceding that it is due to the new inventions. Like most business men, I do not care much for theories, but these are not theories. They are facts, demonstrated by our own experience.

During the last 10 days we have placed orders with the *Scientific American* and other leading papers for advertising in which we make substantially the above claims for the new engine, and are prepared to fully warrant every statement and claim we make.

I have not the slightest doubt that the same and even greater results will be realized when the inventions are properly applied in the manufacture of thin cylinder engines for vehicle purposes.

Trusting you will give this rather lengthy card a place in your columns, I am, Very truly yours,

THOS. KANE.

To the Inventors, Makers and Owners of Motor Carriages.

DEAR SIR :—Given herewith are the official rules and conditions adopted by the Rhode Island State Fair Association for the governance of its race and exhibition of motor or horseless carriages, to be held at its 76th annual fair, Sept. 7, 8, 9, 10, 11, 1896.

These rules are the result of long and careful consideration of the project, and are, we trust, sufficiently comprehensive of the best interests of the motor carriage and equitable in opportunity to all possible contestants.

We hope that the responsive interest of the inventors, makers and owners of these vehicles will be such as to afford a practical and satisfactory demonstration of the present status and prospects of the motor carriage and your personal co-operation with us as a visitor, contestant or exhibitor is earnestly desired.

Trusting that you will give us to the best of your ability your support in our race and exhibition, we remain,

Truly yours, RHODE ISLAND STATE FAIR ASSOCIATION.
WM. HANRAHAN, *Assistant Secretary.*

Official Rules of the Rhode Island Race and Exhibition.

25-MILE RACE. $5,000.00 DIVIDED.

Entrance fee $100 per carriage, payable August 10. No conditional entries accepted.

The race to be five (5) heats, of five (5) miles each day of the Fair, Sept. 7, 8, 9, 10, 11, 1896.

Ten (10) carriages to enter and five (5) to start, or no race.

Vehicles must be able to show a rate of speed equal to 15 miles an hour to compete in the race.

Vehicles must carry one person in addition to the driver. (Weight carried must be 165 pounds.)

Only vehicles propelled by other than animal power allowed to compete.

Vehicles not limited in number, but no one owner can enter more than one carriage and start in the race. If the starters number 10 or more, for reasons of safety, the carriages may be divided into classes and started in two or more divisions.

Division of the race purse will be in the following proportion to the winners of the race, 50, 25, 15 and 10 per cent. of $3,000.00 ; 1st, $1,500.00 ; 2d, $750.00 ; 3d, $450.00 ; 4th, $300.00.

To the vehicle winning the greatest number out of five heats 1st money, etc., etc., but all vehicles must stay in throughout the five heats.

Distance waived, but those vehicles which do not cover the course with an average speed of 15 miles an hour will be disqualified.

Each vehicle will be required to carry its number in large figures ; other printed matter not permitted.

Contestants will be required to conform to such rules and regulations as may be made by the association, particularly in regard to their position on the track. All legal responsibility is thrown upon the contestants, the association declining to assume any whatsoever.

In case that less than five carriages shall respond to the call of the starting judge the race shall be declared off, and to those answering the call and who are ready with their vehicles, their entrance fees paid in shall be refunded. With 10 or more entries received the association will open in addition to the speed contest, prizes to be competed for as an exhibition, judging to be made on points of manageability, etc., etc., for $2,000 divided as follows :

First prize, $1,000 and the association's gold medal and diploma.

Second prize, $500 and the association's silver medal and diploma.

Third prize, $300 and the association's bronze medal and diploma.

Fourth prize, $200 and the association's diploma.

In the exhibitive competition the following percentage scale of points shall be made the basis of awards :

Speed........	40 per cent.	Cost..........	10 per cent.
Control.	20 " "	Maintenance..	5 " "
Simplicity....	10 " "	Appearance...	10 " "

Vehicles may compete, if desired, in both racing and exhibition.

Entries will close Aug. 10, 1896. Entry blanks will be furnished on application.

RHODE ISLAND STATE FAIR ASSOCIATION.

Mr. Hewitt Criticises the Providence Rules.

SPRINGFIELD, MASS., July 17, 1896.

FREDERICK E. PERKINS, ESQ., President R. I. S. F. A.

Dear Sir:—I have just been reading over the rules and conditions of your motor race. If you really desire a concourse of motor vehicles I think that some of your conditions are ill advised.

Most of the people engaged in making motor carriages now are men of small capital, and to add $100 entrance fee to the cost of getting to Providence and the expense of staying there may be the straw that breaks their backs.

Some might desire to go there to show their carriage with no expectation of winning prizes.

There is no objection to any owner not getting more than one prize in the two kinds of competition, but it seems to me as if it would be more interesting to have all the carriages on hand that can be induced to come, whoever owns them.

Further, "all vehicles must stay in throughout the five heats." If five carriages only start, and one becomes disabled will that be construed as a reason for throwing up the whole scheme of the race?

I think also that the 15-mile limit will be objectionable to some electric carriages, and to some which may be short reached or with managers not very experienced. Being run on a curved track may deter some from speeding up, for fear of tipping over. They still may be very good carriages for other work. We are very anxious for a well attended race, and have more at stake in this matter than you have.

Should you adhere to the $100 entrance fee, I would suggest that besides giving that back you give each starter, if less than five come to the front, a further sum of $100 to cover expenses.

A purchaser of one of our wagons has an offer to show his carriage about the date of your fair, at another fair. While he would like a chance at the prizes you offer, he hesitates to pay $100 besides the expenses and so possibly lose a sure thing and be out of pocket besides, if your race did not come off.

Inventors are busy working up their wagons. The date of Aug. 10 is early for them, perhaps to be sure that they will be ready for the competition.

I hope you will be persuaded to give us all the leeway in your power. I hear constant reference to the motor wagon races at Providence and think that it will be a big card for you as well as for us, if they come off. Both of us will lose standing if for any reason they fail to come off.

I think that it would be preferable to scale the prizes down, if fewer contestants appear, than to throw up the race entirely. I hope that the deep interest I feel in the subject will excuse the suggestions I make. Very truly yours,

DURYEA MOTOR WAGON COMPANY,
Per George Henry Hewitt, President.

Names for Motorigs.

Editor Horseless Age:

Vessels and boats from the largest to the smallest are named. It is the custom to name them.

Now that a new vehicle is coming into use it would be a pleasant fashion to give each one an individual name, the same as is given to boats.

It would be desirable also for each manufacturer to put a number on each vehicle he sends out, as pianos are numbered, so as to give each one an identity of its own.

The names and mottoes here given are arranged in groups or classes. In addition to furnishing names from which to make selections they will no doubt suggest others which fit the ideas of the individual better than any contained in the list.

Sentimental mottoes might be used according to the taste of the owner. Poetry, patriotism and politics can all be drawn upon. Religious sentiment would even not be out of place.

Home Body, Near By, Not Far, Soon Again, Short and Often, Short Trips, Suburban Scenes, Airing, Fresh Air.

Visitor, By Request, Expected.

Recreation, New Life, Good Health, Sunbeam, Fair Weather, Sunny Skies, Sunshine, No Clouds, Harmonia, Concordia, Hope, Esperance.

Pleasure Seeker, Good Times, Jolly Crowd, Jolly Time, Pleasant Time, Pastime, Fancy Free, Joyous and Free, The Tramp, The Wanderer, Outer, Vacation Outer, Outdoor Life, Pleasant Trips, Bon Voyage, Glückliche Reise, Glück Auf.

Good Luck, Mascot, Lucky Dog, Safe and Sure.

Tourist, Traveler, Excursionist, New Scenes, Change, Change of Scenes.

Ranger, Wide Ranger, Wild Ranger, Free Ranger, Free and Joyous, Frei und Frah, Free and Careless, Freedom, Liberty, Far Away, Far and Wide, Forest and Plain, Hill and Dale, In the Clouds.

Rover, Wild Rover, Park Rover, Red Rover.

Restless, On the Wing, Not for Long, Up and Away, On the Move, On the Go, Gad About, Flitting Shadow, Flitter, Butterfly, Flying Cloud, Come and Go, Round About, Flutter By.

Roughing It, Rough and Tumble, Camp Life.

For Hunting Rigs.—Hunter, Wild Hunter, Jaeger, Wilde Jaeger, On the Wing, Snap Shot, Wild Roe, Wild Deer, Wild Fowl, Das Wilde Hirsch, Red Fox, Fleet, Fleet Foot, Coyote, Antilope, Red Deer, Carrier Pigeon, Road Runner.

For Racing Rigs.—Number One, Ichi Ban, Num Bahd, On Top, Watch Me, Streak of Light, Greased Lightning, Hummer, Scorcher, Humming Bird, Black Falcon, Dust Giver, Comet, Before the Gale, Flying Gale, Flying Scud, Leader, At the Head, Fleet Foot, Flyer, Falcon, American Eagle, Speedwell, Come On, Swiftsure, Got There, Am There, I'll Be There, Any Message? Flying Storm, Catch Me, Overtake Me, Pick Me Up, Shall I Wait? Too Fast? In the Lead, Toboggan, Black Racer, Blue Racer, Coach Whip, Whirlwind, True Blue, Light Foot, The Turtle, The Snail, Wait For Me, Clear the Track, Hurrah! I'm Here, Applause, Run Right Over Me, Three Cheers.

For Business Rigs.—Business, Enterprise, Progress, Busy Bee, Up to Date, Horseless Age, Up to Time, In the Procession, The Century, Don't Miss Me, Favorable Opportunity, Pioneer, Now's Your Chance, Now's the Time, Good Chance, Best Opportunity, See You Soon, Eagle Eye, Back Soon, Soon Again, Look Out For Me, Expect Me, Wait For Me.

For Heavy Farm and Road Rigs.—Samson, Hercules, Sandow, Doctor Winship, Lugger, Tugger, The Clinder, The Cat, The Canal Boat, The Scow, Jumbo, All Right, Forward, Advance, Move On, Go Ahead, Load Up, Pile It On, Can Take It All, Yes, None, Too Much, Can't Overdo It, Carry All, Ready, Always Ready, On Short Notice, Reliance, Count on Me, Speculate on Me, Depend on Me, Invest on Me.

For Coaches, Stages and Mail Carrying Rigs.—Rocket, On Time, Right Through, Push On, Quick Time, Express, Quick Trip, No Delay, Reliable, Look for Me, No Disappointment, Dependance, Every Time, Reliance.

Local Tourist Centres.—Yosemite, Shasta, Del Monte, Coronado, Snow Lakes, Tamelpais, Diablo, Bay Country, Contra Costa, Ignacio Valley, Aloha. POMAGADEL.

CONTRA COSTA, CAL.

Power for Motocycles.

BY LELAND L. SUMMERS.

The comparatively recent impetus which has been given the motocycle is hardly due to any new conditions or circumstances tending to create a demand for the road vehicle, but rather to the evolution of a motor that promises a greater degree of practicability than any that has preceded. The French and the Germans have taken the lead in the development of the modern road vehicle, and have produced a type differing very radically from that of the early experimenters. Two motors are now available that were unknown to the earlier workers, and the more recent progress has been in the application of these to a vehicle. The gas engine, or internal combustion motor, in its various forms and the electric motor are really to be credited with the success of these vehicles.

The designer of a motocyle has at his disposal practically three forms of a motive power—steam, gas and electricity—with possibly a fourth in compressed air. Notwithstanding the development which has been made in the application of steam to stationary work, or even to locomotive practice, with the exception of liquid fuel there is little available in this line to the engineer of to-day that was not available 40 years ago. More economical results are obtained in large units, and these units have been increased to an extent undreamed of by the earlier engineer. But in the small units the better proportioning of parts, a more economical expansion and a possible improvement in minor details are practically the only features differing from the earlier practice. The two most important questions pertaining to the motor to be adopted, *i. e.*, weight and efficiency, in the case of the steam engine are both affected by the steam pressure used; this seems to have been recognized by the early investigators as clearly as by the modern engineer with his more thorough knowledge of thermodynamics. It would appear that some of the early attempts were made with steam pressures of 175 pounds, and even 250 pounds per square inch; pressures which would hardly be considered allowable to-day for ordinary handling, even with the sectional boilers and improvements both in workmanship and materials of construction. The use of high pressure steam enabled a comparatively light motor to be used; but the auxiliary devices—the boiler, fuel and water—necessitated a cumbersome design, while the difficulties and inconveniences of maintaining a fire under the boiler were serious obstacles.

It is not surprising that attention should be directed toward the internal combustion motor, when its advantages are considered. It is complete in itself—that is, the one piece of mechanism contains the equivalent of furnace, boiler and engine. It may be started almost instantly, without the necessity of kindling a fire or of waiting for steam to be generated; while in addition to all this there is the important factor of economy of operation.

Let us consider the thermodynamic possibilities of the internal combustion motor as compared to the steam engine, and it will be possible then to better understand the advantage possessed by the former. The conditions of maximum theoretical or thermodynamic efficiency will be expressed by Carnot's well-known formula $\frac{T_1-T_2}{T_1}$, T_1 being the absolute temperature of the supply, and T_2 representing the absolute temperature of rejection. The range of temperature worked through is therefore the measure of the thermodynamic efficiency, and any increase of this range will increase the possibility of obtaining a higher efficiency. In the steam engine we have to deal with a medium which is not a true gas, as the pressure increases more rapidly than the temperature, and for this reason the maximum temperature is restricted, as the pressure very soon approaches the limits of the materials of construction. Taking steam at, say, 200 pounds per square inch, gauge pressure, the temperature is only 387 degrees Fahr. or 847 degrees absolute, and if this is expanded to the practical limits of the atmosphere the final temperature would be, say, 213 degrees or 673 degrees absolute temperature, and the maximum or thermodynamic efficiency would be $\frac{847-673}{847} = 20.6$ per cent. If condensing apparatus were used, the final temperature could be correspondingly lowered, say a vacuum of 27 inches be maintained; this would correspond to a temperature of about 110 degrees, and the thermodynamic efficiency would become $\frac{847-570}{847} = 32.7$ per cent. Thus, it is evident that the lower limit has been reached, and the only way in which the range of temperature can be extended appears to be by heating the steam independently of the water from which it has been generated. Under these circumstances it can be superheated to almost any degree the lubricants and materials of construction will permit. Modern development seems to tend toward this method of increasing the range of temperature.

M. Serpollet, of Paris, has used superheated steam on his vehicle, and some tests made showed the nominal steam pressure was 58 pounds per square inch, corresponding to a temperature of 306 degrees Fahr., while the temperature of the steam issuing from the boiler was 1,009 degrees Fahr., and the temperature at the steam chest was 572 degrees, the steam being superheated about 266 degrees.

Comparing the steam engine to the internal combustion motor we find that the internal combustion motor starts with the initial temperature of the furnace, while the temperature of the cylinder walls may become the final temperature. Taking a test by Prof Capper on an Otto gas engine, the temperatures being calculated, we have an initial absolute temperature of 3,503 degrees, and an absolute temperature of mixing after entering cylinder of 605 degrees; the maximum theoretical efficiency was therefore $\frac{3503^\circ - 605^\circ}{3503^\circ}$ 82.7 per cent. It will thus be seen that the gas engine has a maximum theoretical efficiency of four times that of the steam engine under ordinary conditions, and about two and one-half times under the best possible conditions. On the other hand, in examining the *actual* efficiency, or the ratio of the heat turned into work, to the heat actually available to the engine (which is limited by the range of temperature worked through), one finds that the steam engine is far more efficient than the gas engine. In a recent test of a large triple-expansion engine the actual efficiency was 65.9 per cent. (that is 65.9 per cent. of the energy, obtainable from a perfect engine working through the same cycle, was obtained). The thermodynamic efficiency due to the range of temperature worked through was 31.5 per cent. The thermal efficiency or the ratio of heat turned into work to total heat received was therefore $31.5 \times .65 = 20.7$ per cent. The thermal efficiency of the gas engine mentioned above was 22.8 per cent., so that the actual efficiency was $\frac{22}{.827} = 27.5$ per cent. The mechanical efficiency of the steam engine was 89.4 per cent., and of the gas engine

85 per cent., the horse-power developed by the steam engine being 529 and by the gas engine 13. The heat was expended in the gas engine as follows:

Utilized	22	per cent.
Rejected in jacket water	38	"
Rejected in exhaust	40	"
	100	per cent.

If the gas engine in small units can approach the best possible efficiency of the steam engine of large unit working through unusual ranges of temperature, it is evident why the gas engine should be looked upon as involving great possibilities. As only one-fifth to one-quarter of the heat supplied is utilized there appears to be room for improvement. It will be noticed that the chief sources of loss are the high temperature of exhaust and the heat radiated to the jacket water. The early gas engines did not utilize more 5 or 6 per cent. of the heat supplied, owing to the difficulty of obtaining sufficient expansion and the consequent high temperature of the exhaust.

In applying the gas engine to vehicle propulsion, compressed gas could be used, or the gas may be generated directly from petroleum. Owing to the convenience and compactness of the latter, it is used almost exclusively. The more volatile petroleum products, known as gasolene or naphtha, are commonly used, as a suitable gas can readily be made by passing air over or through the liquid. A slight amount of heat aids this very much, so it is common practice to heat the air or petroleum slightly by passing the products of the exhaust around a jacket containing the supply of petroleum. Devices for impregnating the air with the petroleum vapor are usually termed carburetors. It is also possible to simply spray the petroleum through the air as it enters the cylinder, and to thus form an explosive mixture.

In considering the electric motor, it is somewhat difficult to compare it with the gas or steam motors, as the cost of operation is dependent upon locality and particular conditions to a far greater extent than either of the other motors; it not being a prime mover, it must depend upon some other source of power. For application to road vehicles there is but one practical way of obtaining this power, and that is from a storage battery. The electric motor itself is superior to any other form of motor from its portability, ease of control, efficiency and cleanliness, so that the problem really becomes one of a suitable storage battery.

The efficiency of a storage battery depends largely upon the rate of charge and discharge; a small cell may be used and a heavy discharge obtained, so that considerable power may be obtained for a given weight, but this decrease in weight may be accompanied by a corresponding decrease in efficiency. There will also be a very heavy depreciation of the batteries. The recent development in storage batteries has been in the details, and in some respects a returning to earlier types, the cells used for heavy discharges usually being formed under the early method used by Planté in his batteries. The cells used in commercial work are much heavier for a given output than the early type of cells, the present tendency being to diminish the repair and depreciation account. The earlier type of cell offered in the American market would give an output of about six ampere hours per pound of weight, and if we assume an average of two volts throughout the discharge, this would mean an output of 12 watt hours, or equivalent to 31,800 foot pounds per pound of weight. The cells now on the market give from one to four ampere hours per pound of weight, a fair average for ordinary rates of discharge being 2.5 ampere hours, or equivalent to 13,250 foot pounds per pound of weight. A higher rate of discharge can be used and a greater power obtained, but the total energy available will be diminished. Taking as an example one of the cells on the market, we have

Discharging at 5 amperes, capacity	40	ampere hours
" 7 " "	35	" "
" 10 " "	30	" "
Weight of cell, complete	19	pounds
" " elements	14½	"

We would then have

1420 pounds per horse-power, with a capacity of	8	hp-hours
1010 " " " " " "	5	"
710 " " " " " "	3	"

and a possible maximum of about 400 pounds per horse-power, with a capacity of one hp-hour. Referring to recent tests we find one vehicle weighing 1,650 pounds; of this weight the battery amounted to 664 pounds, 600 pounds being the elements themselves, and the remaining 64 the containers and electrolyte. There were fifty cells in the vehicle and they were rated at 50 ampere hours at a discharge rate of 5 amperes. It will be noted that this is 13.3 pounds per cell, and that under this normal discharge the battery gave 1 horse-power per 980 pounds of weight; the actual power available, then, was .67 horse-power with a capacity of 6.7 hp-hours. Under the first conditions of the test the discharge was 10.5 amperes, the output was 1.36 horse-power, or 490 pounds per horse-power, while under the second condition it was 22.5 amperes, an output of 2.9 horse-power, or 290 pounds per horse-power. Under these last conditions the capacity would hardly exceed 3 hp-hours. While there is a great gain in output, therefore, there is the corresponding loss in capacity, but in addition to this there is a heavy depreciation due to the excessive discharge, as the storage battery is heir to more physical and chemical ills than any other form of storage the engineer has to deal with.

There were two motors used on this vehicle. The *electrical* efficiency of each was about 82 per cent. under the first conditions of test and about 85 per cent. under the second conditions. It would be possible to raise the efficiency somewhat if only one motor were used, but it would involve some additional mechanism and would also prevent the use of the series parallel control. With storage batteries the voltage of the source of supply can readily be varied and the control obtained in this way, so the economy of the series parallel control of the motors is largely eliminated; it has, however, the advantage of distributing the load equally to all cells of the battery, which would not be the case with the series control of the cells unless a multiple arrangement were also adopted for the intermediate speeds or an intermittent system employed.

In considering comparative weights per horse-power, it would probably be safe to assume that the gasolene motors weighed about 100 to 150 pounds per horse-power, while the transmission devices, supply chambers, etc., represented the balance of weight; the vehicles being of heavy design to withstand the mechanical stresses imposed by the weight and moving machinery. If the supply tanks are added, it is probable that the weight would amount to 150 to 200 pounds per horse-power available.

The electrical motors weigh 60 to 90 pounds per horse-power; as a good design for stationary purposes, using cast steel or forged fields and pole pieces, weighs about 100 pounds per horse-power in sizes of three to five horse-power, adding

500 pounds per horse-power of storage batteries, roughly estimated, it will require about 575 pounds per horse-power.

The steam motors thus far produced in this country can hardly be considered representative, and it would enable a more just comparison to be made by considering some of the results obtained abroad.

The boilers used by M. Serpollet in some recent light vehicles weighed about 400 pounds, and, in a large vehicle using 15 horse-power, the weight of the steam apparatus is given as 65 pounds per horse-power. M. Serpollet's boiler is peculiar in that no water reservoir is included in the boiler, the boiler feed being used as a means of regulating the engine. The boiler tubes are very thick, and the water is forced through them in a thin sheet so that steam is instantly generated and in the upper tubes superheated. An evaporation of about 8 pounds from and at 212° Fahr. is obtained per pound of coal; a test made with briquettes showed an evaporation of 8.28 pounds from and at 212°, while the engine of 4.5 horse-power showed a consumption of 29.8 pounds of steam per hp-hour. It will be observed that this is a very much better performance than the best simple non-condensing high-speed engines of large size give, and approximates the performance of a Corliss engine of medium size.

We may expect, then, the weights per horse-power of the various motors to be about as follows:

	Pounds per horse-power, ordinary conditions.	Best conditions of ordinary practice.
Gas	125—200	50—100
Steam	150—300	75—125
Electricity	800—1000	550—750

The utilization of the power furnished will depend largely upon the methods of transmitting the power to the wheels, and the electrically propelled vehicles will possess a distinct advantage in this respect.

If we assume the storage battery to have an efficiency of 60 per cent. at the heavier discharge which would be used in order to economize weight, and we take the electrical efficiency of the motor as 85 per cent., we have an absolute efficiency of the electrical system of 51 per cent.—that is, 51 per cent. of the power stored in the vehicle will be available for driving the mechanism and the vehicle.

If we assume as the basis for a rough comparison that the petroleum distillation ordinarily known as gasolene is mostly composed of pentane having the chemical composition $C_5 H_{12}$ the calorific value is readily calculated and is found to be about 21,000 British thermal units per pound; under these circumstances each pound of gasolene would represent an available energy of 778 × 21,000 = 16,338,000 foot pounds. As the best output obtained in the tests was 1,268,000 foot pounds per pound of gasolene, the efficiency was about 7.75 per cent., but as 42 per cent. additional work was developed and utilized in the mechanism the thermal efficiency was 13.4 per cent. If we assume a possible thermodynamic efficiency of 75 per cent., the actual efficiency was 17.8 per cent.

Considering now the efficiency of the steam engine, if we assume 14,000 British thermal units as the calorific value of the coal and coke used. The evaporation was shown to be 8.28 from and at 212 degrees, while the theoretical evaporation would be $\frac{14,000}{.966} = 14.5$, so the efficiency of the boiler was $\frac{8.28}{14.5} = 57$ per cent. The engine used 29.8 pounds steam per hp-hour, and each pound of steam contained 1,175 heat units, but as it was superheated 266 degrees there was added to this 176 heat units, and the total heat per pound supplied the engine was therefore 1,351 heat units or 1,351 × 778 × 29.8 = 31,322,000 foot pounds, while only 1,980,000 foot pounds were utilized; the thermal efficiency was therefore 6.3 per cent.; while the thermodynamic efficiency was about 34.8 per cent., and the actual efficiency was therefore 18.4 per cent.

We have therefore a comparison between results as follows:

ELECTRICAL:

Electrical efficiency of motor.	Secondary generator.	Per cent. of energy carried available.	$\frac{\text{Available weight. of motor.}}{\text{Per cent. energy available.}}$
85	60	51	1470

STEAM:

Thermal efficiency of engine.	Efficiency of boiler.		
6.3	57	3.6	3400

GAS:

Thermal efficiency of motor.			
13.4		13.4	747

The last column is obtained by dividing the average weight of the different motors by the figure representing the per cent. of energy available. As the figures for the weight of the vehicles are supposed to be based upon equal capacities—that is, equal supplies of fuel and water for the gas and steam engines and the equivalent thereof in the storage battery—the figures roughly represent the comparative advantages as regards weight and efficiency. The difficulties of replenishing will count more severely against the electrical vehicle, but in addition to this the storage battery will be subject to the original losses of charging, which include the losses of the prime mover and also the losses of the generator. In addition to the motor losses we have considered there will also be the mechanical losses in the motors themselves and in the transmitting devices.

The problem of transmitting the power to the driving wheels involves many difficulties, particularly with the gas engine. It is necessary to start the present gas engines without load and then throw the load on; for this reason a countershaft is usually provided and the additional frictional losses may amount to considerable. Gears, belts, sprocket chains and friction drives have all been used for connecting the motors to the shaft or to the drivers; the designs, for this reason, differing very widely, so that no type can be accepted as standard as yet. The arrangement of the driving mechanism and the location of the driving motors are also in a measure experimental. The question of eliminating vibration by the balancing of moving parts and the avoidance of shock from the action of the motor involves some interesting problems of machine design. Many of the vehicles presented at the recent contest of the *Times-Herald* were subject to some criticism from this standpoint.

The simplest designs may not necessarily be the best, all things considered. A single shaft with the wheels mounted solidly, a differential gear being inserted, constitutes a simple arrangement and requires but one sprocket and chain, but the tendency abroad seems to be toward the adoption of two separate sprockets and chains and the insertion of the differential gear in the countershaft. If two separate motors are used there will be no necessity for a differential gear, as the wheels will be driven independently, and difficulties from undue friction in making sharp turns, etc., are entirely avoided. Methods of controlling speed seem to involve the greatest amount of experimental work, for while no difficulty is encountered in accomplishing this result, the methods necessarily entail more or less complication when a motor such as the internal combustion motor in its present form is used. The control of speed by varying the mixture supplied to the motor, while constituting perhaps the simplest form, may be open to some objections from the standpoint of economy.

There are many points which require further experimental data to place them on a scientific basis. It is only due to the liberality of Mr. Kohlsaat, of the Chicago *Times-Herald*, that the present data upon motocycles have been made available. The industry is indebted to his generosity not only for the data but for the interest which has been awakened in this country.—*Electrical Engineering.*

* * *

Dr. Booth's Motor Cab in Completed Form.

Readers of THE HORSELESS AGE are aware that Dr. Carlos C. Booth, a practicing physician of Youngstown, O., has been engaged upon a motor wagon, or cab as he calls it, for over a year past. For several months he has been using this cab in making his professional rounds, having the distinction of being the first physician in the United States to use a motor vehicle in his practice.

This vehicle was entered in the *Cosmopolitan* race under rather discouraging circumstances, due to haste and imperfect experimental work, but the doctor now believes that he has conquered all difficulties, and has a satisfactory means of horseless locomotion.

In the course of his business the doctor states that he has made a speed of fully 16 miles an hour, climbed hills of 10 to 15 per cent. grade at five miles an hour, ridden through mud six inches deep at five miles an hour, and through mud two inches deep at 12 miles an hour.

The vehicle weighs 1040 pounds, and the body is especially designed to hide the means employed to propel it.

The motor, which was designed and built by W. Lee Crouch, of New Brighton, Pa., weighs 130 pounds, and is claimed to develop three horse-power. The cylinder is 4 x 6 inches, the balance wheel 18 inches in diameter, and the speed is 500 revolutions per minute.

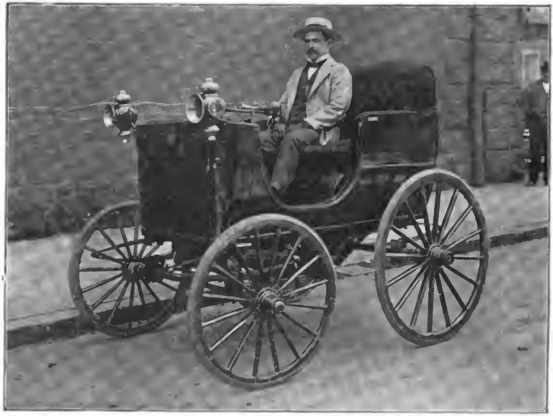
So completely is the exhaust muffled that no disagreeable noise is heard.

Power is transmitted at slow speed by a cut steel chain, made by the Boston Gear Works, running on sprocket wheels to fit. At high speed a 4-inch belt is used in connection with two Bleveney friction clutches, put on or off the high or low speed as desired.

This chain and belt transmit to the countershaft, and from that power is transmitted to the rear axle by another chain and sprockets.

On the rear axle is a compensating gear.

The foot-brake lever is connected with a drum-brake on the countershaft.



PHYSICIAN'S MOTOR CAB. DR. CARLOS C. BOOTH, YOUNGSTOWN, O.

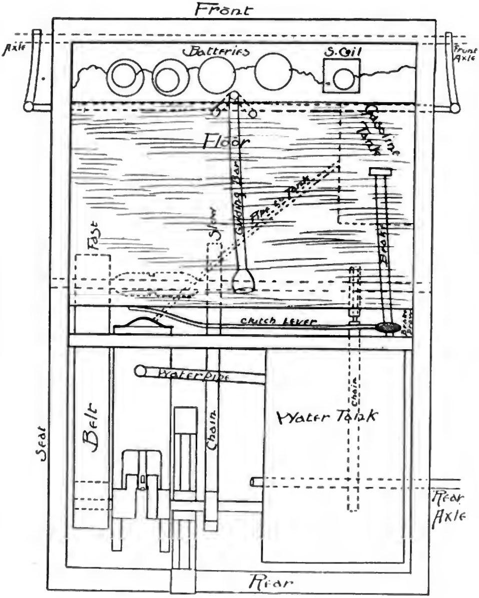


DIAGRAM OF WAGON OF DR. CARLOS C. BOOTH.

DR. CARLOS C. BOOTH.

The first American physician to use a motor vehicle in his practice.

Steering is done by means of a lever, connected below the bed of the body, with the usual fork and lever device.

The motor is started by means of a crank in front of the seat.

Dr. Booth has given quite a number of the business men of Youngstown an opportunity to compare the pleasures of "motoring" with driving, with the result that the preference in nearly every case was given to the former.

The Fredonia Manufacturing Co., carriage builders, of Youngstown, executed the carriage work in a most commendable manner.

Taking it all in all, the doctor believes he has about as serviceable a motor wagon as has yet been produced.

◆

The Holmes Method of Transmission, Steering and Control.

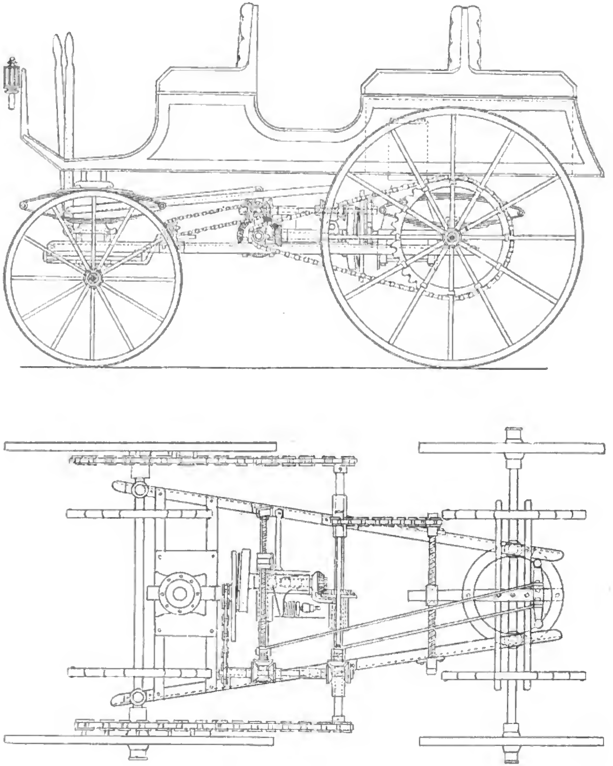
The E. & B. Holmes Machinery Company, of Buffalo, N. Y., are numbered among those who believe that the transmission of power in a motor vehicle is rather more difficult of mastery than the power itself. They have given a good deal of study to the former phase of the question, and have now worked out a transmitting gearing which they regard as a solution of the greatest difficulty that at present confronts the builder of motor vehicles.

A preliminary and partial account of this method was published in the March issue of THE HORSELESS AGE, but we are now enabled to give full details.

The movable friction disc, which is brought into contact with a smooth driving disc on the motor shaft, also acts as a balance wheel. The friction disc runs nearly parallel with the driving disc so that the driving power is produced by two flat, smooth surfaces running together. This way of transmitting power has been patented in England, Canada, Germany, France and Belgium as well as in the United States, and is said to have been thoroughly tried in driving iron lathes, planers, shapers, drills, and, in fact, almost all kinds of iron and woodworking tools, so that a full test of its driving power and durability has been made.

It will be seen that the power of the motor is transmitted by the frictional driven disc, and by moving the driven disc from the centre of the driving disc its speed must be increased, and by moving the driven disc toward the centre of the driving disc its speed must be reduced, and if moved across the centre of the driving disc the motion is reversed, so that by the movement of the friction disc across the face of the driving disc, all the speeds required in either direction are produced, and if the discs are separated or moved from each other all the movement of the driven disc is stopped while the driving disc may continue to run. The power is transmitted by the driven disc and a pair of bevel beads, which have an endwise movement, and by which a cross shaft is revolved at different speeds, and by sprocket wheels on each end of the cross shaft and the chain connected to the sprockets on the wheels, so that when the parts are placed in position and the motor set in motion, it is claimed, the movement of the driven disc is easily, positively and quickly controlled. This is done in a very simple manner by the use of a screw rod having a frictional wheel on the end, which is driven in either direction by being brought in contact with small bevel wheels on a small shaft that runs at right angles to the screw rod, and which is driven by a chain and sprocket on the motor shaft and is always running when the motor is running. The screw rod driving wheel is brought into contact with the cross shaft friction by a lever running up to the driver, and by which the screw may be set in motion in either direction and consequently moves the friction disc in either direction with the strong screw force, and when moved to the centre of the driving disc loses its contact with the driving disc and acts as a break to the wagon, but when moved still further past the centre, will come in contact again and give a reverse motion to the driven disc.

After the transmission and control of power, the next thing in the order of importance is a positive and easily controlled guiding or steering device which the Holmes Company provide by what may be called a short tongue connected to the forward axle or fifth wheel, projecting backward. The back end of this is connected to a cross screw which is turned rapidly in either direction by the power of the motor. It will be interesting to motor wagon builders and users to know that in such a simple and effective manner as has been described the power of the motor is used not only to propel the vehicle, but also to increase and decrease its speed and to steer or guide the wagon. A few pounds' pressure applied to a lever will produce any movement desired as to speed and guidance of the wagon and will also apply the break. The jar of the front wheels caused by striking any obstruction is received and held by the guiding screw, and can never be felt by the hand of the operator; neither can the wagon be turned from its course by the wheels striking any obstruction of unevenness in the roadway.



HOLMES' SYSTEM OF TRANSMISSION AND CONTROL.

Foreign Notes.

A Paris manufacturer of motor vehicles has received an order for half a dozen motor ambulances to be used in the Indian service.

French makers are putting more power in their motors now.

The Automobile Club of Paris celebrated the formal opening of its Summer villa in the Bois de Boulogne with a brilliant fete, in which about 400 members and guests took part.

The Locomotives on Highways Bill has reached its second reading in the House of Commons, and has been referred to the Standing Committee on Law.

D. Farman, a young mechanical engineer of Paris, has just published a book of over 300 pages, on motor vehicles. J. Fritzsh, 30 Rue de Dragon, is the publisher, and the work is said to contain a very full exposition of the subject on both the scientific and historical sides.

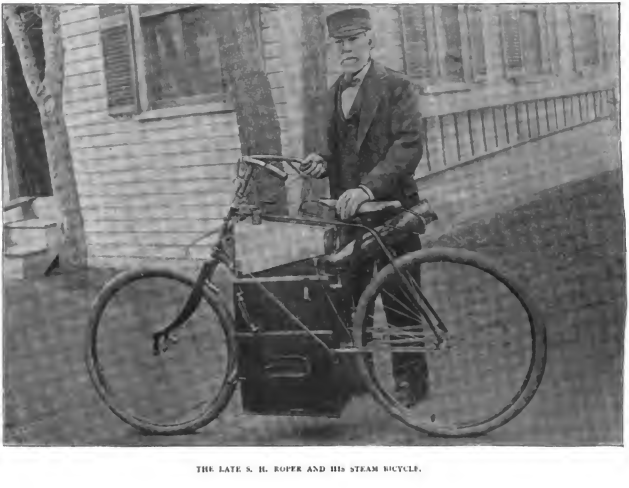
M. Mors, an electrical engineer of Paris, is building a 3¼-hp petroleum motor, which has the electric ignition but without batteries, the spark being furnished by a small dynamo, operated by the motor itself. By means of this arrangement M. Mors claims he is able to run his motor at 1,000 revolutions to the minute. He is mounting this motor upon a new vehicle, which will soon be ready for the market.

Writers in the English press have coined the verb "motor-car," meaning to proceed in a motor carriage, and an exchange informs us that the Honorable Secretary of the Motor Car Club of London suggests the term "viamote," instead of motor car.

A 6-hp Roger carriage was recently imported into Bombay, India, for the use of one of the rajahs.

A special exhibition of motor carriages and cycles recently took place at the Hurlingham Polo Grounds under the management of the Motor Car Club. Several of the carriages now at the Imperial Institute were run down to Hurlingham by their own power, a special permit having been given by the London County Council

The Omnibus Company of Paris, which is negotiating for the introduction of motor buses in place of the horse conveyances now in use, insists before agreeing to this replacement that the City of Paris shall bind itself to purchase all the plant and rolling stock at the expiration of its franchise in case this is not renewed.



THE LATE S. H. ROPER AND HIS STEAM BICYCLE.

MINOR MENTION.

A company for the manufacture of motor wagons is being organized at Annapolis, Md.

J. W. Lambert, Anderson, Ind., is developing a new carriage motor, which he believes will be a world-beater.

C. H. Barrows, Willimantic, Conn., has effected a sale of the right to manufacture his motor carriage in Greater New York, Philadelphia, Baltimore, Washington, Richmond, Va., and Chicago.

W. M. Ashley & Son, Springfield, Mass., have a Duryea motor wagon which they propose to exhibit at fairs and expositions. Those wishing to add such an attraction should correspond with them.

Crosby Bros., United States mail contractors operating the Haymond and Fort Stockton stage line in Texas, are among the owners of Western stage routes who are waiting impatiently for a practical motor stage to appear.

The Northeast Baltimore Improvement Association intend to hold an illuminated bicycle and motor carriage parade about the middle of September, to celebrate the paving of Broadway with sheet asphalt, an improvement for which the Association has labored long and earnestly.

The American Motor Company have taken the contract to build a vehicle for C. H. Barrows, Willimantic, Conn. A No. 1 American motor will furnish the power, and the whole construction will be of the bicycle kind. The work will be performed at the company's shops, 1304 Hudson Street, Hoboken, N. J.

DAVID H. MEAD.

SOLICITOR OF

United States and Foreign

PATENTS.

Suite 63-64, Loan and Trust Building,

WASHINGTON, D. C.

It is of advantage to have an application for patent in charge of an attorney in Washington. Objections made by Patent Office Officials can be met more quickly and satisfactorily by personal interviews than by correspondence, resulting in more speedy allowance of applications.

SPECIAL NOTICES.

Advertisements inserted under this heading at $2.00 an inch for each issue, payable in advance

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J. R. MARTIN,

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WANTED—A party to join in the manufacture of this advanced implement for aiding the agricultural and transporting industries. Address for particulars the inventor, WILLIAM G. CLARK, No. 54 John St., New York City.

GAS and oil engine expert, with several years experience in the motor carriage business, wants permanent position. Write for particulars and address "Y. M.," care THE HORSELESS AGE.

The Motor League

has a Mission.

JOIN IT.

The Woillard Gas Engines.

Eugene P. Woillard, Sugden, Dade County, Fla., has three different patents now pending in the Patent Office. Two of them are on compound gas and vapor engines, and the other is on a simple high-pressure gas and vapor engine. All are double-acting and reversible, and can run in either direction by the mere use of a lever.

Mr. Woillard is now at work upon a rotary gas and vapor engine, which he expects will be well suited to vehicle use.

Any one of the above engines is adapted to the propulsion of boats or vehicles.

JOIN.... The American Motor League.

"Above reads $23\frac{4}{10}$ miles."

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This is our Cyclometer adapted to use on carriages, and provided with mud cap for wet weather.

REGISTERS 10,000 MILES.

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Easily attached to front axle.
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THE HORSELESS AGE.

A MONTHLY JOURNAL

DEVOTED TO MOTOR INTERESTS.

VOL. I. NEW YORK, AUGUST, 1896. No. 10.

THE HORSELESS AGE.

E. P. INGERSOLL, Editor.

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COMMUNICATIONS.—The Editor will be pleased to receive communications on trade topics from any authentic source. The correspondent's name should in all cases be given as an evidence of good faith, but will not be published if specially requested.

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THE HORSELESS AGE, 216–218 William Street, New York.

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The Providence Race.

The event of the year in motordom on this side of the Atlantic will be the races at Narragansett Park, Providence, R. I., Sept. 7 to 12, under the auspices of the Rhode Island State Fair association.

The plan of introducing this novel feature into the program was first formulated last April, and since that time a wide publicity has been given to it through the local advertising of the association and through the press of two continents. The interest manifested in this part of the program throughout that section of New England is so great that the largest attendance in the association's history is anticipated, while experts and enthusiasts from the remotest quarters of the globe will watch closely the first race of motor vehicles ever held on a race track.

The track is one of the finest in the country, and the ability of the management is attested by the uniform success of the fair in the past. Conditions for high speed are most favorable, and spectators will enjoy a constant view of the competing vehicles, which they could not have in a road race. For a contest of this character, therefore, Narragansett Park leaves nothing to be desired.

Considering the financial stringency, which, at present, is the worst enemy the new industry has to contend with in America, the number of entries is rather encouraging.

As the course is ideal for the electric vehicles we may expect to see some lively brushes between them and the gasolene wagons. On many practical points in the construction and operation of motor vehicles valuable experience is sure to be gained that will aid the manufacturer, the promoter and the user.

For one thing at least the motor industry has reason to be grateful to the Rhode Island State Fair Association—after this precedent races will probably be held on race tracks, where they belong.

The Distribution of Awards.

Dr. Carlos C. Booth, of Youngstown, O., whose motor cab competed in the *Cosmopolitan* race unsuccessfully, sends a communication to THE HORSELESS AGE, in which he criticises the action of the judges in awarding the entire purse to the Duryea Motor Wagon Company, while he and the other unsuccessful contestant received nothing.

The doctor contends that his expenses at least should have been paid, and recalls the liberal policy pursued by the judges of the *Times-Herald* race in so dividing up the purse that every contestant secured some substantial recognition.

There are obviously two sides to this question. The judges of the *Cosmopolitan* race were limited by a set of rules which required the vehicles to cover a certain course before being eligible to an award. The Duryea wagons were the only ones that covered the prescribed course. Hence, under the circumstances, the judges would have exceeded their authority had they given any other decision.

That the liberal policy pursued at Chicago is far better at this initial stage of the industry the doctor is quite right in contending. Inventors, as a rule, are not rich. Experimental work is expensive, transportation, hotel bills, etc., are also heavy items, and the prospect of at least a partial reimbursement for this outlay will turn the scale with many who hesitate to make the venture.

Patent Litigation.

Rumors of patent litigation now begin to be heard both at home and abroad. Companies who believe that they have purchased broad, fundamental patents in the new field are bestirring themselves, and looking about to see who of the many claimants seems to be trespassing upon their alleged exclusive territory. It is more than likely that out of this circumspection a number of important and most costly patent suits will grow.

Before entering upon such a policy, however, the holders of motor patents would do well to study the history of the electrical trade and the disastrous effect of patent litigation upon its earning capacity. They will find that the leading corporations in that leading industry have expended in useless patent warfare a sum sufficient to pay magnificent dividends upon their enormous capital stocks. The result is that in these stringent times these aforesaid corporations could pay much better dividends if they had not carried so large a patent account.

* * *

The first number of THE HORSELESS AGE is now out of print. Parties who are willing to pay a premium for it are requested to send in their names to the editor, when an effort will be made to supply them at a price to be announced later. We still have copies of Nos. 2 and 3, although at the present rate of sale both of these issues will soon be out of print, too.

Recent Motor and Gas Engine Patents.

565,033. *Gas or Oil Engine.*—Joseph Robison, Greenbush, N. Y. Filed Oct. 24, 1894. Serial No. 526,794. (No model).

565,123. *Rotary Engine.*—Gordon J. Scott, Philadelphia, Pa. Filed June 6, 1896. Serial No. 594,483. (No model).

565,786. *Gas or Vapor Engine.*—Ransom E. Olds and Madison F. Bates, Lansing, Mich., said Bates assignor to P. F. Olds & Son, same place. Filed Aug. 24, 1895. Serial No. 560,381. (No model).

566,263. *Gas or Petroleum Engine or Motor.*—Bela Wolf, Mülheim, Germany. Filed Dec. 14, 1895. Serial No. 572,158.

566,800. *Magnetic Traction Apparatus for Motor Cars.*—William Robinson, Boston, Mass. Filed Oct. 12, 1891. Serial No. 408,466.

566,959. *Rotary Engine.*—John G. Albee, Fulton, N. Y. Filed July 18, 1895. Serial No. 556,369.

567,037. *Spring Motor for Velocipedes.*—Martin J. McDonald, Trenton, N. J. Filed Feb. 21, 1896. Serial No. 580,276.

567,104. *Rotary Engine.*—Erick M. Lindfors, Cleveland, O. Filed April 6, 1896. Serial No. 586,282.

566,056. *Roller Bearing for Wheels of Vehicles.*—Alexander C. Brownell, Providence, R. I. Filed May 13, 1896. Serial No. 591,385.

566,125. *Vaporizer for Oil Engines.*—Arthur Barker, London, England, assignor to Grover & Co., Ltd., same place. Filed March 7, 1896. Serial No. 582,191.

Crawford Wheels and Tubular Gears.

Builders of motor vehicles are looking about for the lightest mode of construction they can find for the frame and wheels of their vehicles. Within the past decade steel has been constantly rising in favor as a constructive material in proportion as its cost has been lowered, and its superior qualities have become more generally known. Profiting by the example of the bicycle, the Crawford Wheel & Gear Company, of Hagerstown, Md., began some two or three years ago to apply the lessons the bicycle had taught to the lighter class of four-wheeled vehicles that are now drawn by the horse. For the iron tire they substituted a heavy pneumatic, which after repeated tests answered their expectations in every particular, and for the wooden frame of the ordinary buggy they substituted the tubular steel frame of the bicycle. Hundreds of road-wagons, phaetons, traps and runabout wagons of this style of construction have been built by this concern and sold all over the United States. The results to purchasers have been so satisfactory that the works of the Crawford Wheel & Gear Company are crowded to supply orders.

Inventors and builders of motor vehicles will find this company ready at hand to figure on all kinds of pneumatic wire wheels and tubular steel gear that may be required in vehicle construction.

They also furnish solid rubber tires and wooden wheels for those who prefer them.

Bogies.

BY CHARLES E. DURYEA.

It is often asserted that men and women are but grown-up children, meaning thereby that in their habits, actions and thoughts they are but children of a larger size, and this assertion is given credence by the importance which rational men and women will give to certain things of little importance, magnifying them until they become veritable giants. The inventor is met at every turn by the prejudices and narrow-mindedness of people who are considered liberal in their views, until, in many cases, he becomes disgusted with humanity at large and therefore cynical, and is dubbed by supposedly rational people as a "crank." Too often, however, the fault is not on his side, but on the side of the public in general, for, as before asserted, too often men and women who are liberal and broad-minded on other subjects are afraid of anything that seems like innovation, and avoid it as they would a ghost or other bogie.

The steam engine has added to the world's wealth more than any other one invention, and yet at the time of its invention the best men of the age criticised and reviled it. It was common talk that it would prove dangerous to life; that the escaping gases from the first locomotives would kill trees, grass, cattle and possibly people. Even so late as the time of the application of steam to the propulsion of boats, people regarded Fulton as visionary or crazy, and were in many cases sorry for him, feeling that he was rather to be pitied than blamed, while the thought that he deserved praise never entered their minds.

Eminent mathematicians proved conclusively by figures that cannot lie that no vessel could carry sufficient fuel to supply steam enough to drive it across the ocean.

That persons would be foolhardy enough to allow themselves to be drawn over the land at a speed of 12 to 15 miles an hour seemed preposterous, and was pronounced by some to be physically impossible. The trolley car was regarded as a pretty toy less than 20 years ago, and ocean cables could not have been laid by men of common wealth and ability.

There is no need to name these things further. The history of almost every invention of importance is that in its earlier stages it met with some of the most unreasonable objections, and the objectors lived long enough to see their objections forced down their throats, but the new generation raises quite as absurd objections against the new inventions of to-day. We find many people who should be willing to believe in and accept the motor vehicle, raising objections that are no more sound than those just cited. The writer, who in his experience with the motor vehicle, has met many objections, wishes here to answer a few of them.

Perhaps the most important objection is that of noise. The average man seems to have set his mind upon an ideal vehicle which does not make any noise, and yet he is unable to point out such a vehicle unless, perhaps it be the bicycle, and in this particular instance many legislators are passing ordinances compelling the bicycle to carry a bell, so that it may do the very thing that seems objectionable. This fact—that the bicycle is required in many States to make noise—is proof that humanity is accustomed to noise and that noise is a requisite rather than an objection in the perfect vehicle. Many will pronounce this statement radical and far-fetched, but the exceptions to the rule will prove it rather than disprove it.

The trolley car of to-day is far more acceptable as a vehicle than the horse car of yesterday, but it is more noisy, more dangerous and less easily controlled. This one example alone should be sufficient proof that if the article does the work the people will accept it regardless of noise, danger or manageability.

The railroad train is not a silent affair, it is a pandemonium of noise compared with the old stage coach on the dirt road, but where will you find stage coaches to-day running in opposition to a railroad? The steamship is not so quiet as the sailing vessel, and yet few passengers take passage for Europe except on a steam vessel. Many other instances might be cited to show that what the public require is results, rather than unimportant features like noise. If the motor wagon will accomplish its purpose of carrying its load where the load is to go, the public will accept it, regardless of whether it is noisier than the horse or not, and while the writer fully believes that the noise should be eliminated as far as possible, without interfering with the simplicity or the power, he is confident that, even if quite noisy, the public will accept the vehicle.

The same arguments apply to the vibration bogie. A man engaged in business in New York City, meeting all classes of people, and supposedly of good judgment and broad mental capacities, pronounced the motor vehicle a failure and a thing which will require another 50 years to perfect, on the ground that there was too much vibration. The same man goes to Buffalo *via* fast railway train with its constant vibration when he could get there *via* canal boat with scarce a tremor. Either he does not live up to his convictions or else he lies. The probability is that he permitted himself to be narrow-guaged for the present, and his prejudice caused him to make a statement which another five years will find him sorry for.

It is not necessary to repeat the examples above given, but where there is noise there is usually unpleasant vibration, and so the above examples will apply to this point.

A third bogie is that of odor. Time and again the motor vehicle has been condemned because it gives out a different odor than is given out by other things now in use, and being different it impresses the observer as very vile, and therefore certain to prevent the public use of the motor vehicle. "Imagine a street full of such vehicles! Why, you could not live in the same town!" observed one original kicker, and yet the same man reads his evening paper by kerosene lamp and his wife does the cooking on a gasolene stove, both in a closed room, and both giving out products of combustion and gasolene of the same quality as is used in most motor vehicles. It is true that when starting and stopping the motor vehicle often it does not secure a perfect combustion and some types of motors never secure the same, but it is equally true that a dirty lamp burner fails to secure perfect combustion, and yet will be used night after night without a thought of complaint.

It is also true that everybody rides behind locomotives which give out not only the products of combustion of coal, but sulphuric gases arising from impurities in the fuel, cinders, and specks of soot and coal blown out by the forced draft. They do not revel in these objectional features as if they enjoyed them, but they patronize that method of travel and do not usually complain. They may argue that they must travel and that there is no other way, but this objection does not hold good to-day. If Americans were to refuse to ride until better accommodations were afforded, the accommodations would be forthcoming in short order. Smoke stacks would be placed where they would not throw objectional products back and over into the train, or else electric motors would be used which make no such products. The American public, however, is too good-natured to take such action. They put up with these objections in the locomotive, and capitalists may rest assured that they will do likewise with the motor wagon if need be, but unlike the motor and the horse, in the motor wagon the objectionable features can be and usually are behind the riders, where they are not in evidence, and in this respect the motor wagon is much superior to the locomotive or the horse wagon.

Further, such odor as there is from the motor wagon does not contain elements of filth, or gases that are decidedly poisonous.

Another bogie is that of manageability. The average man trusts his horse to attend to the driving almost as much as he does himself, and in many cases the horse knows more than the driver about good driving, and for these reasons many believe that the motor vehicle cannot become popular. That such is not the case is evidenced by the testimony of many who have driven motor wagons and who find them exceedingly manageable, and prefer to drive them rather than to drive a horse. There is no independent will which must be controlled before the wagon can be controlled, and this renders the motor vehicle far more manageable than the horse vehicle. That there is no great hardship in having to assume the complete management of the vehicle to the exclusion of the horse and his ideas of management, is proven by the thousands who ride the bicycle without finding its management a detriment.

Frightening horses is yet another reason in some people's minds for objecting to the motor vehicle. They know that such things as a piece of paper, a stray animal, a pile of rocks, a baby buggy, or a thousand and one other things, are often responsible for scared horses and runaway accidents, and it would seem that any man of broad mind would be willing to accept another possible cause without serious kicking, if we admit that the motor vehicle is a possible cause, but when we remember that the motor vehicle is not subject to fright at the possible causes before named, as is the horse, we can see that the safety of the public is increased by the number of motor vehicles that come into common use, rather than otherwise. If any one doubts this statement, let him imagine all vehicles driven by motors, and he will thus see that accidents from frightening horses disappear entirely. It is a matter of safe legal decision that no one using due care is responsible for frightening a horse except the owner or driver thereof who if he take upon the road an unsafe animal must be responsible for the consequences thereof.

Yet another bogie is "break-downs." Men who would not hesitate a minute about attempting to drive a team and who would believe themselves able in a short time to learn to manage a locomotive or a steamboat, get very much concerned when they think of running a motor vehicle. This, like many other scarecrows, proves to be a scarecrow only at a distance, and it will be found that in this, as in many similar problems, familiarity solves the problem.

The early sewing machine makers found it quite difficult to persuade womankind that they had sufficient mechanical ability to run and keep operative a sewing machine, but to day the woman who cannot operate one is the exception and few now even think of being unable to manage one. The same is true of steam engines. Whereas only a few decades ago the steam engineer was looked upon as a superior creature, to-day almost every boy considers himself competent to manage an engine.

A few years ago the street car companies were afraid that their horse drivers could not become motormen, but the men rose to meet the need and there is now no difficulty in securing competent men for this service.

In all lines this is true. We find delicate and complicated machinery everywhere—from the lightweight, carefully made, almost fragile bicycle to the heavy locomotive, with its complication of parts; from the many-pieced, constantly used typewriter to the more complex printing press. Men and women are using machinery, and although they began to do it with fear and misgiving, they have become familiar with it and confidence has increased until the thought of breakage enters into their minds no more to-day than when they wrote letters with goose quills or printed papers by hand. So it will be with the motor vehicle. A few weeks' time will enable one to become thoroughly acquainted with every part of the machine, and it will be found no more complicated than the machinery around an ordinary machine shop. Minds that are capable of grasping very ordinary mechanical problems will be found capable of managing the motor vehicle, and the bogie of breakage will be laid aside forever.

A good example of this class of bogie has been well shown in the case of the pneumatic tire for bicycles. When it was first offered to the public in 1847, or thereabouts, it met nothing but failure, and when again offered to the public as a speed accelerator about six years ago most people saw nothing in it outside of a limited use on the track. Even men of most liberal minds could not believe that it would be taken up by the public. They thought that the fear of puncture and the difficulty of holding the air and repairing the puncture permanently would prevent its acceptance, but in this seemingly extreme case the merit of the article won. As soon as it became a belief of the public that the pneumatic tire ran more easily and comfortably than other tires, it was demanded, and to-day no one thinks of riding anything else. The substance of the whole thing is the public desires results, and if the motor vehicle accomplishes the purpose the many little features raised by objectors all around us will fall to the ground and die of their own insignificance.

DON'TS.

BY HARRY E. DEY.

Don't use packed joints, they are an endless source of trouble. Let the cylinder and head form one integral part, and screw all valves in down to a shoulder, being careful to leave stock enough outside of the thread to prevent springing of the valve seat, especially if the latter has a conical bearing.

Don't use a water jacket. It is another unnecessary nuisance.

Don't use a single cylinder. The greater the number (within reasonable limits) the better satisfaction you will have.

Don't use copper, or any other good heat conductor, for cylinders.

Don't use aluminum where strength is required. The same weight of steel is many times stronger.

Don't let your sparker operate at every revolution on a four cycle engine. On a failure to explode at the proper revolution it is liable to go off on the next with disastrous results.

Don't fail to give your engine a governor to vary the ignition lead; I have found it very advantageous.

Don't build an engine large enough to carry your load up any grade with one gear. It is cumbersome, besides being very expensive to run, consuming nearly as much gasolene without a load as with, and the expense of running a gasolene engine *practically* is not always the same as it is in print.

Don't keep the primary circuit of the induction coil closed except during the time of ignition. This saves at least 75 per cent. of the current and a larger percentage of the burning of the platinum contacts.

Don't use too heavy a primary current for the same reasons.

Don't use a make and break inside of cylinder The contacts will not last or keep clean, and an automatic lead can not be used with it.

Don't forget to place a flame arrester between the cylinder and the carburetor, or tank.

Don't (if you use a carburetor) depend on getting your gasolene in a strange place. If you do you are liable to find, after tiring yourself and trying to start your engine, that the dealer has given you some other grade than 76 degrees, probably thinking that it was a mere whim and that anything that went by the name of gasolene would do just as well. If you could only give him the job of making the engine run with it he would probably be more respectful of whims next time, but you usually get several miles away before the trouble develops.

Don't let your engine puff in passing frightened horses. Shut off the admission of gas and they will immediately stop their prancing and dart past, giving you a chance to let in the gas in time to prevent the engine from coming to a stop.

Don't use a fifth-wheel steering device.

Don't gear with sprocket and chain to axle, they soon wear and stretch, and are then a constant annoyance.

Don't brake on rubber tires. They slip under a brake as if greased when wet, and cannot be depended on.

Don't waste your time and money on primary batteries for propelling vehicles. It might as well be invested in perpetual motion, so far as any honest returns are concerned. Primary batteries can be made to propel vehicles, but not commercially.

Don't sacrifice results to simplicity. While every part should be made as direct-acting as possible, nothing should be left out that will in any way tend to a successful result. We do not have to compete against the first cost of a horse and carriage. There is an almost unlimited demand for the successful horseless carriage regardless of price.

Don't use a gong. People hearing them take them for trolley cars, and if not directly on the track pay no attention, as they suppose that as long as they are clear of the track they are safe. A vibrating bell should be used, electric preferred.

Don't forget that sudden spurts of speed and quick stops are absolutely essential to prevent accidents on city streets.

◆

Summary of the "Cosmopolitan" Race.

The September issue of the *Cosmopolitan Magazine* contains a brief account of the motor vehicle race of May 30, concluding with the following summary of the editor's views on the subject:

"'Do the tests made under the auspices of *The Cosmopolitan* show the horseless carriage in shape for practical, every-day use?' is the question which the reader will ask.

"'Yes,' and 'no,' must be the reply. To the person already familiar with machinery, and capable of exercising proper intelligence and care, the horseless carriage stands ready to his hand.

"That it is already the complete motor carriage, prepared to meet all the various requirements demanded by the public, must be doubted. That it is making the most rapid strides toward such perfected condition we can not doubt. That horseless carriages will soon be on the market, of qualities and prices suitable for general use, we must believe.

"Going from the realm of fact to that of imagination, the views advanced some months ago in *The Cosmopolitan* can not be materially modified. The horseless carriage promises, by its cheapness of operation, to give a vehicle which can be brought to the curb line of the street to receive passengers, at a fare not exceeding five cents. It thus promises to do away with the jerky, overcrowded cable and electric cars, and to substitute a noiseless, smooth and agreeable carriage, over asphalt streets, at the same cost, with the element of danger reduced to a minimum. Its general introduction will probably result in a three-cent car fare, as the first result of competition, and an increase of speed on elevated roads."

◆

Good Words from L. T. Nichols—A Scheme for Utilizing Compressed Air.

L. T. Nichols, West Concord, Minn., who is associated with the Owatonna Manufacturing Co., Owatonna, Minn., in the development of a motor carriage, writes that they, in common with others, have found the problem more difficult to solve to their complete satisfaction than they at first anticipated. They are not the kind to turn back, once having laid hand to the plow, and are working out some ideas now that seem full of promise.

They have built four gasolene motors and discarded them all as too complicated for the purpose. The fifth one, on which they are at present engaged, has no water jacket or exhaust valves. The exhaust port, which is always open, and makes practically no noise whatever, is as large as the surface of the piston head. In this manner it is claimed that power is also saved. No crank shaft is used, and an explosion occurs every revolution of the fly-wheel.

They have devised a very simple mechanism that gives eight inches leverage all the way over one-half of the circuit, when the expansion is giving out power, and on the other half when the compression is taking place, the leverage is only two inches.

The motor can easily be run at 1000 revolutions, varying from that rate to 200 revolutions as power is needed.

In addition to this control of the motor a variable speed gear is employed, which gives great power to ascend grades.

They are at work upon a manila rope transmission, which they expect great things from, and have experimented considerably with a dynamo for sparking purposes.

Compressed air is also an attractive field of experiment for them, and they are now planning a motor to be operated in this way—a motor which every farmer who has a windmill can use, keeping a supply of air constantly on hand for any passer by, under a mutual agreement.

This idea is yet in embryo, so Mr. Nichols says, but he has a firm faith in its ultimate practicability.

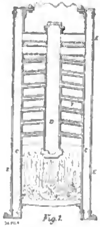


Fig. 1.

Fig. 8.

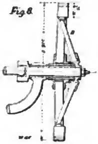


Fig. 2

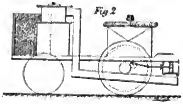


Fig. 3

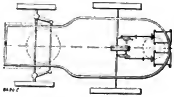


Fig. 5.

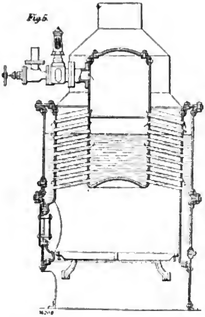


Fig. 6.

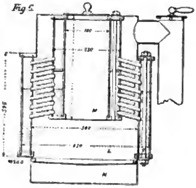


Fig. 4.

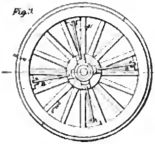
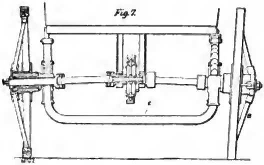


Fig. 7.



STEAM TRACTOR. DE DION, BOUTON & CO., PARIS, FRANCE.

The De Dion et Bouton Road Motor.

Another great competition of road motors is now being arranged in France for next October; in due time we shall give full description of this interesting event, and shall very shortly be able to furnish the programme. The principal French constructors of this class of vehicle intend to take part in the competition, and conspicuous among the motors will be a hauling engine, constructed by Messrs. de Dion and Bouton, with which it is intended to draw from Paris to Marseilles one of the enormou three-horse omnibuses of Paris. The present is therefore an appropriate time to resume our series of articles on French road motors by describing in detail the principal types of traction engines designed by Messrs. de Dion and Bouton, of Paris. It may be mentioned that these two names, which are now so closely associated, became so almost by accident; the Comte de Dion, who is an amateur engineer, associated himself with M. Bouton for the purpose of introducing a boiler of a special type, which we shall have occasion to describe in the course of this article. It appears that this boiler has very high steam-producing qualities with a relatively small weight and volume, and it was the adaptability of the generator to power vehicles that first induced them to turn their attention conjointly in this direction; the success which they have attained is, in fact, chiefly due to the generator.

The first De Dion and Bouton road motor was placed on the streets of Paris as long ago as 1884; as may be easily supposed, it was an experimental and altogether crude contrivance, very far from presenting the same appearance of convenience and even elegance to which the modern vehicles of Peugeot, Panhard and Levassor and others can lay claim. There was no mistaking the unfavorable impression which this first experiment produced. Both generator and engine were strongly *en évidence*, the latter being in front of the two persons, for whom accommodation was provided on a back seat. The vertical boiler was also in front of the vehicle, and the platform carrying it, as well as the motor and the seat, was attached to a frame that rested on four wheels by single springs in front and double springs at the back. As a matter of historical interest we may give the exact dimensions of this first experimental carriage. The length of the frame was 70.87 inches, and the wheels were placed 63 inches apart from axle to axle; the floor of the vehicle was 21.66 inches from the ground, and the seat was placed at a height of 35.13 inches. Power was transmitted to the front pair of wheels, which were 47.24 inches in diameter, the rear wheels, which were used for steering, being 31.50 inches in diameter. The type of wheels was that of the cycles of the period, very rigid, and formed with light round iron spokes, the tires were protected by rubber; this was an important improvement on mechanical carriages of the time, and the first De Dion and Bouton machine had at least the advantage of being comparatively noiseless. The rear steering wheels were loose on two independent axles, on each of which was a crank formed by a coupling-rod; on this was attached the steering lever placed to the right hand side of the conductor. The boiler was of the De Dion type referred to above, and at that time was claimed to be a new system. It is illustrated by Fig. 1, above, and consists of a double envelope, *E* and *C* forming the body of the boiler, and to which all the ordinary boiler fittings were attached; the firebox was placed in the lower part of this envelope; in the centre was a cylindrical tube *D* connected to the inner shell *C* by a number of inclined and radial tubes *T*. The efficiency of this boiler seems to have been satisfactory, especially for the purpose for which it was being used; an average evaporation of nine pounds of water per pound of coke was obtained. An automatic constant level feed-water device was attached to the boiler, so that as long as it operated properly the boiler required no attendance as to the water supply. This automatic feeding apparatus consisted of a double-acting pump, driven direct by a motor to which steam was supplied, taken from the boiler at the normal water level. The exhaust from this motor discharged into the water tank so as to raise the temperature of the feed. In order to enable the steam pressure to be kept up when the ashpan was closed tightly, a condition often necessary when running, two steam jets were introduced beneath the grate for inducing a mixed jet of air and steam.

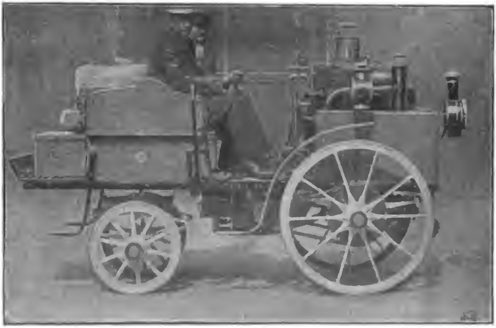
The carriage was driven by independent oscillating engines with a cylinder 2.76 inches in diameter, and 4 inch stroke; a speed of 25 miles an hour, corresponding to a speed of 900 revolutions per minute.

The exhaust from the engines entered an envelope that surrounded the firebox, the object of this arrangement being to cool the walls of the firebox, and at the same time to superheat the steam, so that it might, on escaping into the air, be invisible and comparatively noiseless. In addition to the steering lever, the conductor had on his left hand a controlling lever, which operated two coupled Prony brakes; by means of these the speed could be reduced, or the carriage stopped, the brake straps acting on the two large wheels in front. The carriage itself weighed 286 pounds, to which had to be added 400 pounds for the boiler and fittings; the motor weighed 55 pounds, the feed pump 22 pounds, the spare tools carried 33 pounds, 70 pounds of coke and about 20 gallons of water were also carried, so that the vehicle in working order weighed nearly three-quarters of a ton. Defective as this first experimental machine necessarily was, it proved itself capable of doing considerable work, and on several occasions recorded a maximum speed of 25 miles an hour; it was also able to turn on a radius of eight feet. These early experiments attracted considerable attention, although the time had not yet come for any serious consideration of the use of mechanical road traction in France. Though Messrs. de Dion and Bouton do not appear to have closely followed their first trials, they did not by any means abandon their experiments; but when in 1894 the proprietors of the *Petit Journal* organized their famous competition between Paris and Rouen, the two enterprising experimenters did not hesitate to take part in the competition. They had every reason to be satisfied with the result, for although the first prize was divided between Messrs. Peugeot and Panhard-Levassor, the second prize was awarded to Messrs. de Dion and Bouton, at the same time that a similar recognition was given to Mr. Le Blant.

As a matter of fact, Messrs. de Dion and Bouton had not been idle since 1884, since in the following year (1885) they placed on the streets of Paris a second carriage, which is illustrated in Fig. 2. But little space need be given to describe this second vehicle, the arrangement of which is clearly shown in the engraving. Generally speaking, it closely resembles the type of 1884; the steering wheels were much smaller than the driving wheels; they were placed at the back, and a pitched chain transmission was used instead of a belt. The vertical chimney of the generator, which was not only unsightly, but was an intolerable nuisance in the streets, was somewhat improved by bending it downward beneath the carriage. But in spite of these alterations, the result was unsatisfactory on account of its clumsy appearance, and the large amount of space occupied by the motor, which was placed on the front part of the carriage. For all that, it was a practical road motor, and gave good proof of its solidity and efficiency by making a satisfactory run between Paris and Royan, a little town at the mouth of the Gironde.

Very different to the 1884 type was that of 1889, which was not a motor car but a steam traction engine, in which the motor was carried instead of forming part of the actual vehicle. The inventors elected to call it a steam bogie; as a matter of fact, it was neither more nor less than a small road locomotive designed to take the place of a horse. This pattern is illustrated by Fig. 4. The first impression it conveys is that of unnecessary weight and clumsiness, but the constructors, having an essentially practical end in view, were endeavoring to develop a motor that could be usefully applied to haul any class of ordinary vehicles, and that could be used under very different working conditions, according to whether it was reqnired for relatively high speeds or heavy roads. It was a motor of this type that was coupled to a four-seated victoria in the *Petit Journal* competition of 1894. On that occasion it left Paris at 8 o'clock in the morning, the same hour at which the other vehicles started, and was the first to arrive at Rouen the same evening at 5.40. This trial proved beyond doubt that the machine possessed powers of resistance higher than any of the petroleum motors that took part in the competition. The motor was carried on a horizontal frame formed of U-shaped bars two inches deep and resting on the axles by springs; this frame carried the motor, boiler, water tank and fuel store. The boiler, which was a modified form of the type already described, was almost completely surrounded by the fuel tank; as to the chimney, it is turned back under the carriage, as shown in the diagram, Figs. 2 and 3. The back of the frame is left free, and carries a ring, to which is hooked the front of the vehicle to be hauled, and from which the fore carriage has been removed; this ring is mounted upon springs. The machine is on four wheels, of which the back pair is used for steering; they are controlled by a system of cranks very similar to that already described, and the arrangement of which is indicated on the diagram, Fig. 3. The wheels are of the cycle type and the tires are of rubber 3.15 inches wide. It may be mentioned here that these tires are formed of separate bands of rubber .59 inch thick. The rear wheels are only 2.76 inches in width and have iron tires; they are built of wood, with an iron boss and have several peculiarities to which attention may be called.

Before speaking further of the motor, a few words may be given to the steam generator; it is of the same type as that used in the carriage in 1884, and illustrated in Fig. 1, but several modifications have been introduced. It is illustrated by Fig. 5. These boilers are guaranteed to generate from 4.5 pounds to 6 pounds of dry steam per square foot of heating surface, and from 7 pounds to 8 pounds per pound of coal, using natural draught. Any question of trouble and maintenance apart, it is evident that the large number of small radiating tubes employed presents a relatively large and very efficient heating surface, which ensures rapid generation of dry steam. A large number of these boilers is now being used in France, and among other well-known makers of them are Messrs. Santter, Harlé & Co. From trials recently conducted by this well-known house, it appears that a De Dion boiler, weighing 1,430 pounds empty,



STEAM TRACTOR. DE DION, BOUTON & CO., PARIS, FRANCE.

with a heating surface of 64.5 square feet and a grate surface of less than 3 square feet, consumes 88 pounds of coal per hour and generates 550 pounds of steam.

We may add apropos of this type of boiler that the radiating and inclined tubes constituting a special feature are so arranged that each one is placed immediately above the free space left between two tubes in the adjacent row; this arrangement assures a free circulation of the heated gases. The steam space is situated in a part of the boiler where the temperature averages 250 degrees C., so that the steam is kept dry without being superheated. It may also be noted that in consequence of the inclination given to the tubes a greater elasticity is secured, so that there is no danger of the tubes moving in the tube plates under the influence of expansion.

Some modifications have been introduced by Messrs. de Dion and Bouton in their latest type of generator, which is illustrated in Fig. 6. The boiler is intended to burn coke almost entirely, and the fuel is introduced through the centre as in a portable stove. This form consists of two rings connected by the usual inclined radiating tubes. The upper part of the rings above the water level serve as a steam space, and steam is taken to the motor from the top of the inner ring; a circular diaphragm is introduced to prevent water being taken over with the steam, to facilitate the rapid dismounting and cleaning of the boiler; the bottoms of the two rings are closed by circular pieces connected together by the bolts *F*. The fuel is fed into the centre, being introduced by the passage *M*, which is closed by a light sheet iron cover; the grate is shown at *L* and the ashpit at *N*. The gases of combustion, after having passed around the tubes, enter the chimney, and are discharged beneath the vehicle: the chimney can be cleaned by the soot door *O*. This boiler has a firegrate 13.4 inches in diameter, while the diameter of the internal rings is only 6 inches. The ordinary working pressure does not exceed nine atmospheres, but it is registered to a far higher pressure. The number of tubes is 816, divided into 21 rows, there being 40 tubes in 20 of the rows; the tubes are of copper, .39 inch internal and .51 inch external diameter; the length is 4.40 inches. The heating surface is about 24 square feet, and the grate surface is less than two square feet. The total weight of the generator is 530 pounds, and the production of dry steam is very large. The boiler is fitted with a reheater at the side of the firebox; this is a flattened and bent steel tube protected against the direct contact of the fire by a cast-iron shield.

The motor is placed on the carriage beneath the platform; it is a compound engine with two cylinders, and is large enough to furnish the power necessary for propelling itself and another carriage. The stroke of the pistons is 5.11 inches, the diameter of the small cylinder is 4.72 inches, and that of the large cylinder 7.08 inches; the cylinders are separated by an intermediate receiver, and an automatic oiling device ensures continuous lubrication. For the sake of simplicity there is no variable expansion or reversing gear, but, when desired, full pressure of steam can be admitted into both cylinders. The engine is rated as being of 20 horse-power. This motor is coupled to an intermediate shaft, on which is a pinion that gears into the spurwheel on the driving wheel shaft; the ratio of gearing is 2.81 and the running speed is 330 revolutions a minute, in order to give a rate of 12.5 miles an hour to the vehicle. The weight of the traction engine in working order is two tons, and the constructors claim that it can haul a load of two and one-half tons at a rate of 20 miles an hour on level ground. It can carry a coke supply sufficient for a distance of 60 miles, and enough water for 25 miles. The water tanks are placed beneath the seat.

The De Dion & Bouton motor has a special arrangement for the transmission of power to the driving wheels, to which we may now call attention. The engine power is transmitted with a reduction of speed, not to the axle but to the rim, the intention being to ensure a longer life to the wheels by avoiding the strain on the spokes to which they are exposed when the power is transmitted through them. The pitched chain transmission is also abandoned, which is certainly not an unmixed advantage. Figs. 7 to 9 show the arrangement to which we have just referred. The axle *E* is bent, and at each end it is placed in an axle-box, on the top of which are the suspension springs of the vehicle. This box is traversed by a sleeve which the motor rotates by means of an articulated shaft. The sleeve carries the wheel, but it is longer than the boss, and the end which extends beyond this latter is cut square and forms the centre of a four-armed star B^1 connected to the rim of the wheel by the end of the arms. These ends enter recesses in the rim. It is claimed for this arrangement not only that there is less wear on the wheels, but also that the four driving arms, on account of their elasticity, deaden shocks in passing over a rough road.—*London Engineering.*

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Montgomery Ward & Co.'s Novel Advertising Scheme.

The great commercial house of Montgomery Ward & Co., of Chicago, have decided to adopt a very novel mode of advertising. They have purchased from the American Electric Vehicle Company, of Chicago, an electric brake, which they will exhibit in all the principal towns of the country.

Montgomery Ward & Co. do an immense business through the mails, and send out no traveling salesmen.

A Pullman car has been purchased by the firm and elegantly fitted up for the comfort of those who will have charge of the vehicle. A compartment in the car has been reserved for the reception of the vehicle when journeying from place to place. During the stops it will be run about the streets of the town for advertising purposes.

The brake, which is an elegant specimen of the carriage builder's art, is equipped with two 2-hp single reduction motors which can be worked up to about double their nominal capacity when necessary. The two motors are geared direct to the rear wheels of the vehicle by two small rawhide pinions on the motor shafts, meshing into large brass pinions attached to the axle inside the wheels.

Attached to each of the motors are also two geared wheels for the purpose of changing the speed of the motor shaft when necessary, this unique piece of mechanism being regulated from the driver's seat. The carriage is also equipped with controller, brake and steering apparatus, and for night runs two incandescent lamps are used, which are enclosed in handsome lamp holders of the regular type used in carriages. The carriage is very light in appearance, contains two seats capable of holding six persons, and will be able to run up to a speed of 14 miles an hour. The motors and controllers are of a special pattern made by the American Electric Vehicle Company. The storage batteries are of the make of the Syracuse Electric Battery Company, Syracuse, N. Y.

Motorcycles.

BY S. D. MOTT.

Contra-distinguished from vehicle propulsion by means of power periodically stored (for example the aerocycle in your April issue, page 10) are the combinations known as explosive mixtures.

In the sketches are shown the necessary mechanical elements by means of which a bicycle may be operated safely by either of the following propositions: (*a*) gas and air, (*b*) air carburetted by a hydrocarbon, (*c*) a hydrocarbon atomized by compressed air.

Without pretending to show the precise detail in these drawings, a schematic illustration of proposition (*a*) is shown in Fig. 4, which may obviously be varied to accomplish either of the other two propositions enumerated.

With elements as cheap as most hydrocarbon compounds and air, economy of operation, I believe, is secondary to safety and simplicity, and for this desiderata economy may be sacrificed if necessary. With this end in view the engines shown are of the most primitive type, to be acted on by direct impact like the modern high-pressure type of water wheel, against the buckets of which the blast of the explosion is directed. It thus has no working rubbing parts and is the object of no more solicitude than the ordinary sprocket. Lack of economy, however, in this form of engine is offset by a number of important considerations aside from simplicity, among which is no water jacket, which is said to dissipate more than one-half the power of a gas engine to which must be added the friction of piston valves, etc., etc.

Fig. 1 is a prospective view showing the general appearance of the machine proposed. Fig. 2 is a side elevation showing the several functional parts and their relative disposition. Fig. 3 is a section through the bearing and hub of the driving wheel, the thrust ball bearing and the support ball bearing, together with the turbine on the end of driving axle with the retaining nuts. The axle is here designed hollow to give free access of rushing air to dissipate the heat as much as may be by ventilation, or this space may be filled with water and oil for lubrication. The ball bearings are adjusted by the nuts on the end of axle which when taken off allows the removal of the wheel from the frame and the dismemberment of the motor. The turbine may be screwed on the axle or placed on a square arbor. The part in black shows in section the revolving part of the hub.

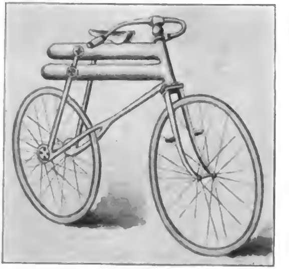
Fig. 4 is a schematic illustration of the working parts, the lower part of the figure being turned one-quarter around in order to present them more clearly. t is the air throttle connected by rod r to the gas throttle t^1. Rod r may be shifted (See Fig. 5) to vary the relative proportions of the mixed gases that the intensity of the explosion, and hence the power developed, may be economically controlled in a simple manner (Fig. 5).

f f^1 are cut-offs with connecting rod r^1 and eccentric which measure and determine the volume of the mixture and disconnect the explosion chamber from the source of supply. The upper cut-off f acts like the breech of a gun and as a flame arrester to prevent ignition above the explosion chamber; if greater precautions were demanded the usual wire gauze may be availed of.

The electric igniting spark may be generated by an ordinary spark coil or magneto. This is shown diagrammatically acting beyond the explosion chamber and is supposed to be working continuously while the circuit is closed. This, however, may be arranged equally well to spark *in* the explosion chamber, in which case the upward movement of the eccentric lever is caused to close the circuit at the right moment. In this case instead of a continuous spark it would be periodical and in conformity to the speed of wheel. When the power is throttled, as in coasting or when at a standstill, the circuit may be opened by a convenient switch.

There is no fixed cycle of operation in the same sense as is found in the ordinary gas engine. There is one impact per revolution of driving wheel (there are two if the engine at the other end of axle is in operation). If it were desired that the engine should be acted on, *i. e.*, an explosion take place every second or third revolution of the driver, the eccentric would be geared down to the wheel at the ratio of 2 to 1 or 3 to 1 respectively; or, if movement were desired by numerous impacts like two or three to each revolution the eccentric would be geared up accordingly.

Fig. 5 shows one of the throttle hand wheels t and the milled thumb nut m, the function of which is to set the pace. This is done in micrometric gradations by shifting the connecting rod r back and forth from the centre to the circumference of t, thereby varying the relative proportions of the mixture subjected to explosion. This may be done at any time when the throttle is opened or the wheel is in motion.



MOTORCYCLE OF S. D. MOTT.

Fig. 6 is the eccentric mounted on small wheels in order that it may perform its functions even through the mud without lubrication.

It is said that 15 per cent. of gas and 85 per cent. of air burns without odor or smoke. Fig. 7 is a view in diagram of air carburettor which may be embodied in a structure on the lines of Fig. 2. The novel feature is a (porous) hose pipe made, to be sure, without rubber being incorporated into its structure. This may be trailed or coiled in gasolene to any extent and which like the wick of the ordinary vapor lamp imparts inflammable qualities to the air by carburetting it. The air

Fig. 2.

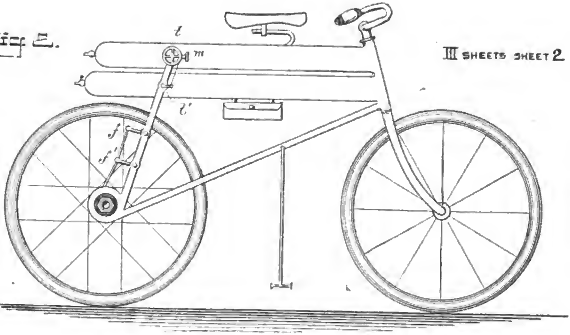
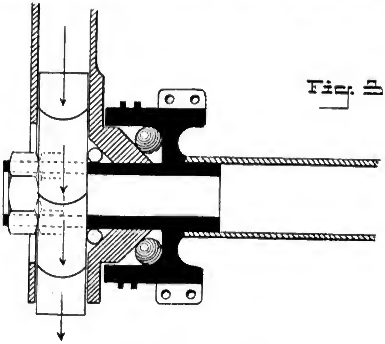


Fig. 3.



MOTORCYCLE. S. D. MOTT PASSAIC, N. J.

III SHEETS SHEET 4

Fig. 7.

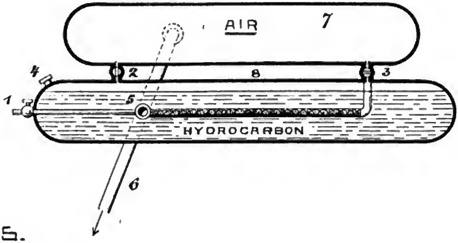


Fig. 5.

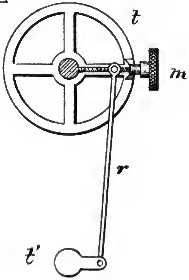
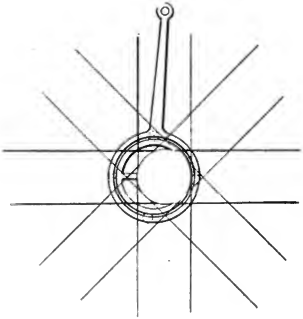


Fig. 6.



MOTORCYCLE. S D. MOTT, PASSAIC, N. J.

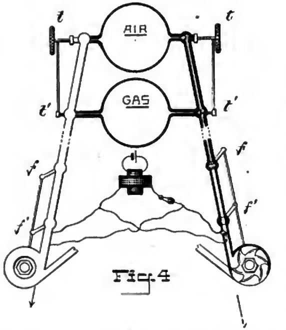


Fig. 4

is forced in by the ordinary air pump at valve *l*, and if cock 3 is closed and cock 2 open, the air is forced through the hose pipe and gasolene, saturating the air with its vapor. If cock 3 is open and cock 2 closed, the air moves through the saturated hose-pipe fabric on entering reservoir, and again when passing to the explosion chamber through *6* by the throttle *5*. This plan may be arranged so that the process of carbureting may be accelerated or retarded by the admission of air pressure on the surface of the gasolene.

As the quantity of hydrocarbon used is very small (one pint per horse-power hour, costing one cent) this may be changed from twin cylinders to a concentric cylinder, with advantage of lightness and appearance, possibly.

The other way mentioned of disposing of the fuel for power purposes is the familiar one of spraying the hydrocarbon by air and igniting it. This is really more of an air engine than an explosion engine in that it is the sudden expansion of the air due to the heat generated rather than explosive force, which does the work. It will be observed that with little modification this may be carried out with the structure here presented.

To summarize: The supply of the gaseous mixture is varied (by the throttle). The volume admitted to the explosion chamber is measured and determined (by the cut-offs). The proportion of the gases relatively is varied (by the milled head on the throttle hand wheel). The explosion takes place at time intervals, which intervals, through the action of the eccentric, vary with and are determined by the speed of wheel, like the ordinary locomotive.

Please observe that this system may be employed in conjunction with the ordinary sprocket and chain gear. The power generated may be applied to the crank axle or hub, or both. With tandems there there may be four points of application, *viz.*, the two crank axles and both ends of driving axle.

Passaic, N. J., August, 1896.

The C. F. Allen Motor Wagon.

Chas. F. Allen, of Hueneme, Cal., is the designer and builder of a motor wagon, a scheme of which we are enabled to furnish our readers in this issue.

The motor is said to weigh 135 pounds and to develop 4½ horse-power. The method of attachment to the frame or bed plates reduces vibration to a minimum, except when the wagon is standing still, and even then the vibration is slight.

Speed is regulated by means of friction discs, controlled by raising or lowering the operating lever, as shown in the drawing.

The driving disc proper is attached to the semi-axles in such a manner as to throw the greatest amount of power on the outside wheels when rounding corners.

The wheels have cushion tires with ball-bearings in front, while the hind wheels are made fast to the half-axles, and run in roller-bearing boxes.

The framework is made of angle steel plates and drawn steel tubing, the tubing also serving to cool the water which passes through the water jacket

The box (not indicated here) acts as a cover to the working gear and motors, but is independent of them, as they are attached to an angle-iron bed plate, with a sheet-iron bottom, one end of which is hinged to the axle boxes, while the other is fastened by two eccentric bolts to the spring, which is in turn fastened to the carrying frame near the centre of the wagon.

This spring being placed under the heavy portion of the gearing and motor, relieves them from jar, and at the same time throws no part of the machinery out of line, being hinged at the other end onto the axle.

Odor is said to be done away with by means of a new device, not described, and the noise of the exhaust is effectually muffled.

The wagon is steered automatically by the motor under the direction of the operator, by means of a single lever. A slight pressure to the right or left is sufficient to move the wheels in the required direction, and when the pressure is removed the wheels are firmly locked in position until a change of direction is desired.

The brake is the friction band type, operated either by foot or by hand, the hand-brake being called into use in an emergency only. This brake is operated in connection with the driving disc, thus doing away with all brake rods and levers on the outside of the box.

An emergency throttle is also provided, in case the operating gear should get out of order.

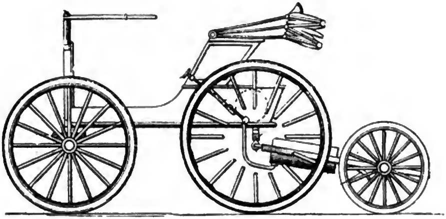
No sprocket chains, ratchets or other noisy gearing are used.

* * *

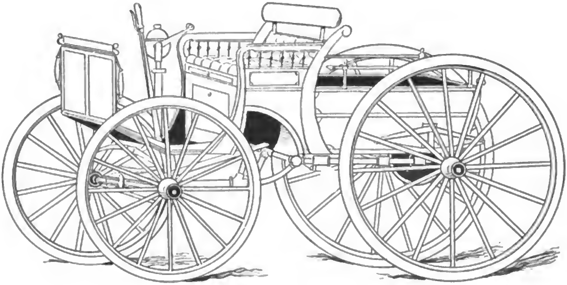
A. H. Kennedy's Recent Patent.

A. H. Kennedy, Rockport, Ind., has taken out letters patent on a decidedly novel idea in vehicle propulsion. He employs a gas motor, or, if preferred, an electric motor, which he mounts upon a pair of carrying wheels and attaches to the rear axle of the vehicle.

The advantages he claims for his method of placing the motor are: That the motor and its carriage can be attached to any vehicle of the present horse type with slight modification; that the weight of the motor, resting upon the driving wheels, gives them all the traction required for hill climbing and slip-



MOTOR VEHICLE. A. H. KENNEDY, ROCKPORT, IND.



DESIGN OF MOTOR WAGON. C. F. ALLEN, HUENEME, CAL.

pery roads, and that in case one class of motor is not available in certain localities another may be substituted.

If desired the motor may be attached to the front axle and run underneath the vehicle.

Nelson M. Baker's Motor.

Nelson M. Baker, Southbridge, Mass., has been studying the motor vehicle problem for more than five years.

His first effort in the way of power for this purpose was a small steam engine of two horse-power, built very light, but strong enough to stand 100 pounds pressure. Steam was furnished by a small boiler, 12 inches in diameter, constructed of flat copper coils, ½ inch in diameter.

But Mr. Baker soon abandoned this plan in favor of gasolene as a motive power.

The motor illustrated here was commenced in March, 1896. It has four balanced cylinders, the cranks working at an angle of 180 degrees.

The cylinders are water-jacketed, and are cast in one piece, the main casting enclosing crank shaft and cams completely.

The two poppet valves are operated direct from the crank shaft by cams, thereby doing away entirely with gears.

The diameter of the cylinders is 4 inches, and the stroke is 6½ inches in length.

Two impulses are obtained every revolution.

Ignition is electric.

The valve mechanism is so arranged that one, two, three or four cylinders can be thrown out of work at will, while the spark ceases when the charge of gasolene and air is cut off, thus saving the battery.

Mr. Baker is building a carriage complete.

Aeronautical Experimenters Want Motors.

James Means, editor of *The Aeronautical Annual*, has issued the following notice to inventors:

The Aeronautical Annual undertakes—as one part of its work—to encourage the development of the light-weight motor.

There have already been issued from the United States Patent Office more than 800 patents on explosion engines.

Several hundred inventors are now at work upon motors of this class, so that rapid improvement may be expected.

The editor of *The Annual* wishes to ascertain which of the explosion engine inventors can produce the motor best adapted to the needs of an aeronautical experiment.

He is ready to place an order for a 4-hp motor if any constructor can be found who is able to furnish what is needed at a reasonable price.

If this motor is secured the editor will give it publicity, and will aid in its introduction. It will first be carefully tested, and then will be fully described and illustrated in the *Aeronautical Annual* for 1897 (No 3).

The following specifications show what is wanted:

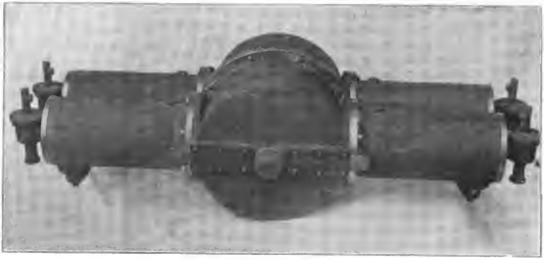
1. The four horse-power motor must develop that amount of power continuously without injurious heating.
2. The weight of the motor must be reduced to the utmost limit compatible with durability.
3. The number of cylinders must be such that there will be no dead-points. The motor will run an aerial screw and will carry no fly-wheel.
4. Simplicity and durability are requisites.

In making bids, specify as follows:

1. The price.
2. The weight of a four horse-power motor, complete, without supplies.
3. The weight of supplies necessary for one hour's run.
4. The kind of fuel used, and the outside limit of quantity and cost of same used per hour in developing four horse-power.
5. The outside length, width and height of four horse-power motor.
6. The length of time which it will take to construct the motor.
7. The numbers and dates of issue of all letters-patent covering the completed motor.

The editor cannot undertake to enter into correspondence until bids are received covering the seven points specified.

The regular address of Mr. Means is Back Bay P. O., Boston, Mass., but until Oct. 1 he can be more directly communicated with at York Harbor, Me.



CARRIAGE MOTOR. NELSON M. BAKER, SOUTHBRIDGE, MASS.

The Lepape Motor Carriage.

La Locomotion Automobile gives in a recent issue a description of a new petroleum carriage just placed on the market by M. Lepape, a French engineer and constructor of motor vehicles.

The vehicle is steered by the rear wheels, the front wheels being the driving wheels.

The body of the vehicle rests on springs, which separate it entirely from the running gear.

All the machinery is tightly encased to protect it from dust and dirt.

The motor has one cylinder of the Otto type. The principal parts are easily accessible *en route*.

Ignition is electric.

The carburetor feeds itself automatically.

Water for cooling the cylinder is contained in two tanks at the side of the motor. These tanks are so constructed that they can be taken out, and are provided with handles so that they can be filled at any well or brook and conveniently carried back to the wagon.

Power is transmitted by a friction disc.

The fly-wheel V of the motor (Fig. 5) comes in contact with the horizontal friction disc G, the motor shaft itself being vertical. Parallel with the motor shaft is the secondary square shaft a, with cylindrical ends turning in swiveling bearings p and p^1. Along this shaft the friction shaft G is moved into and out of engagement with the fly-wheel V. Speed is greatest at the periphery and diminishes as the disc is moved toward the centre. At the centre it is zero, and beyond this point the vehicle is reversed.

The use of chains in transmitting power is avoided by a new and ingenious device. At the end of the shaft a is a pinion p (Figs. 5 and 6), which engages with a pegged wheel, F, attached by an iron brace to the felloe of the driving wheel. In order that the traction may always be equal, it is necessary that the distance from the centres of the pinion should always be the same as that from the pegged wheel.

To accomplish this the swiveling bearings are mounted in collars supported by arms, l, capable of turning upon the fixed axle e of the driving wheels.

This ingenious arrangement, which has been patented by the inventor, allows the operator to raise or lower the shaft a, and thus bring the friction disc into or out of contact with the fly-wheel of the motor. The pinion p always engages with the pegged wheel.

In going forward the pinion p (keyed upon a') engages with the pegged wheel F, whereupon the disc G is brought in contact with the face of the fly-wheel and is held firmly to its work.

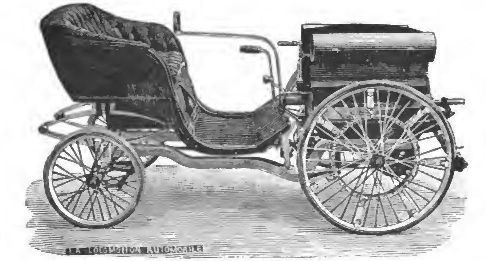
This movement of the arms l is connected to the brake shoe t (Fig. 4), which is applied to the driving wheels. Hence, by means of the single lever M, controlled by a screw of the brake D, a movement is obtained which disengages the friction, and if the movement is continued a sharp brake is applied to the driving wheels.

Two levers and a pedal are all that are requred to control this vehicle. Upon the frame of the carriage near the motor is a vertical shaft held between two iron bands. To the upper part of this shaft is attached the steering lever, which the operator of the vehicle holds in his left hand. At the lower end is a handle which imparts the movement to the steering square controlling the hind wheels.

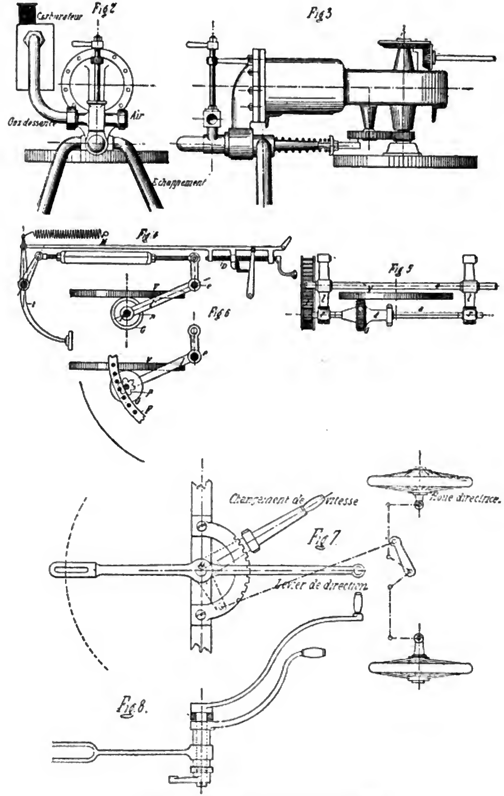
Upon this shaft O (Fig. 7) turns freely a tube, at the upper end of which is a hinged lever, regulating the friction disc G by means of a forked lever at the other end. Thus the position of the disc upon the shaft a in relation to the fly-wheel of the motor is easily regulated. A bolt with a double spring secures this lever upon a notched sector, holding it firmly in the required position.

The pedal controls the movement of the friction disc and the brake explained above, or, on the other hand, in starting the vehicle, it slowly loosens the brake and brings the power into play.

This pedal is supplemented by a screw, D, having its fixed point upon the frame of the motor, which keeps the brakes locked in going down hill and relieves the operator of the



LEPAPE MOTOR CARRIAGE. PARIS, FRANCE.



MECHANICAL DESIGNS OF LEPAPE MOTOR CARRIAGE.

necessity of keeping his foot continually on the pedal. This screw also serves the purpose of preventing sudden shocks or jerks in starting.

The motor is regulated by two levers, one of which controls the mixture, the other the ignition.

For the sake of cleanliness thick oil is used for lubrication everywhere except in the cylinder, which is provided with a sight feed lubricator.

The vehicle weighs about 600 pounds complete, and will carry two persons very comfortably.

The limit of speed is 10 to 12 miles an hour.

The Motor Fete at Spa.

Last month a gay assemblage convened at Spa, a well-known watering place of Belgium, to do honor to the motor vehicle. The brilliant program included banquets, speeches, festivals, races, an exhibition, etc., and was thoroughly enjoyed by the members of the Automobile Club Belge and their guests.

Eight motor vehicles were mustered, including a petroleum tricycle of De Dion, Bouton & Co., owned by the president of the Automobile Club of France. Most of the vehicles shown were driven by Daimler motors. That illustrated here, which received a prize for its artistic decorations, was propelled by a Benz motor.

Among the distinguished guests were the Baron de Zuylen de Nyevelt, president of the Automobile Club of France; the president of the Automobile Club Belge, and Prince Albert, of Belgium.

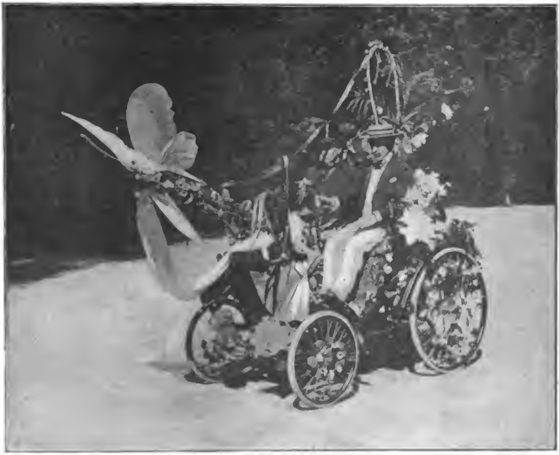
The Riker Electric Trap.

The throng of visitors at the watering-places on the Jersey coast about Long Branch and Seabright were recently treated to the sight of a very nobby trap spinning along the ocean boulevards without the aid of the customary horse. This trap, which is here illustrated, is the vehicle built by the Riker Electric Motor Company, 45 and 47 York Street, Brooklyn, N. Y., for entry in the Providence race.

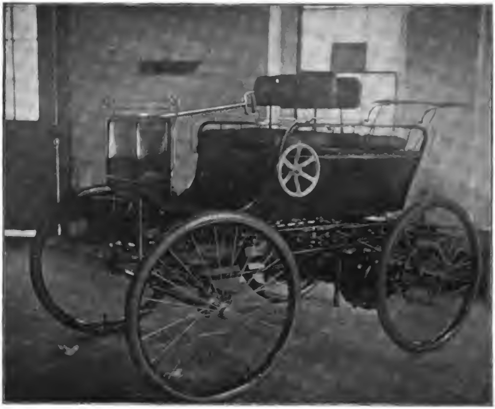
The vehicle weighs 1,500 pounds and carries four passengers. The gear is built throughout of tubular steel, and the wire wheels, three inches in diameter, are the product of the Crawford Wheel & Gear Company, Hagerstown, Md.

The current is derived from 800 pounds of special chloride cells of 100 ampere-hours capacity at a discharge rate of 25 amperes. There are 32 of these cells, which furnish sufficient power for a four-hours' run at 10 miles an hour, over ordinary level roads.

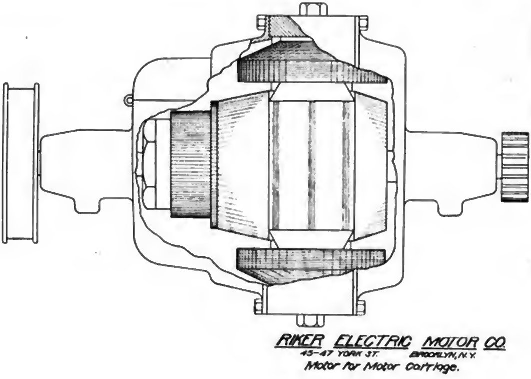
Two Riker motors of normal three horse-power each, weighing 180 pounds each, and completely enclosed so that no



ONE OF THE PRIZE WINNERS OF THE MOTOR FETE AT SPA



ELECTRIC TRAP. RIKER ELECTRIC MOTOR CO., BROOKLYN, N. Y.



dust or mud can reach them, are geared to the rear wheels by pinion and gear at a ratio of 5 to 1.

On the opposite end of the motor shaft from the pinion is a band wheel, around which a powerful strap brake is applied, thus avoiding all braking of the wheels of the vehicle.

Speeds of 5, 10, 18 and more miles an hour are obtained by turning a hand wheel at the side of the seat. Four speeds each way are given, the wheel being turned forward for forward motion of the vehicle and backward for reversing.

The vehicle is steered by a tiller in front of the seat, the wheels being pivoted at the hub as is the custom in motor vehicles. So sensitive is this mechanism that two fingers only are required to guide vehicle. By pressing down on the tiller the wheels are locked firmly in position until a change of course is desired. Inasmuch as the steering gear is carried by the body of the vehicle, and has a flexible connection with the wheels, no shock is communicated to the hand of the operator.

The Riker Electric Motor Company will soon be prepared to furnish electric running gears complete to carriage builders or private parties wishing to follow their own fancy in the design of the vehicle body.

Testing Wagon of Charles B. King.

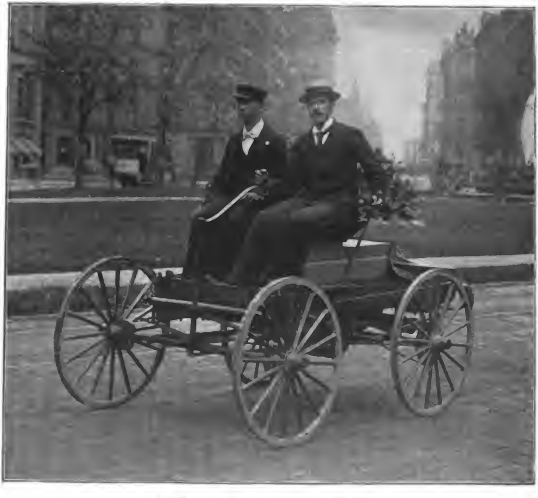
The following view shows a testing wagon used by Charles B. King, of Detroit, Mich., in testing vehicle motors which he is at present manufacturing. The wagon has neither ball-bearings nor pneumatic tires, yet it has been repeatedly run at 20 miles an hour on level roads, and has climbed a 20 per cent. grade with two passengers. About eight gallons of water are used for cooling the cylinders, and the gasolene tank contains five gallons.

The wagon, containing the motor, water, gasolene and all parts complete, weighs about 800 pounds.

◆

C. S. Fairfield's Motor Buckboard.

C. S. Fairfield, Portland, Me., endeavored to apply a 10-hp kerosene motor to a buckboard, which he uses to convey Summer excursion parties to resorts in the neighborhood of Portland. He found, however, that the motor was unable to furnish the required power, either because of faulty transmission machinery or for some other reason



TESTING WAGON. CHARLES B. KING, DETROIT, MICH.

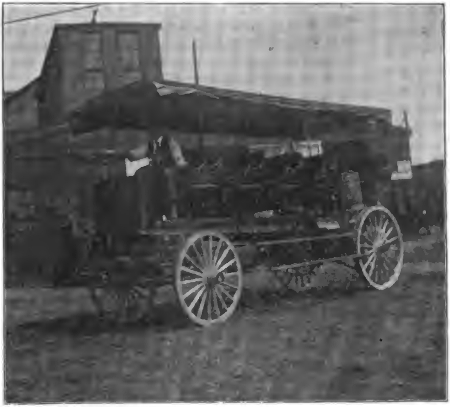
There are three speeds, three, five and eight miles an hour, and a lever for each speed acting on a positive clutch. Another lever is also used for starting or reversing.

Under the operator's foot is a brake.

The motor employs the hot tube instead of the electric ignition, and a pipe was placed over the rear wheel to protect the flame from the wind.

Foreign Notes

Emil Roger & Co., of Paris, are about to float an English company with a capital of £300,000, for the promotion of the Roger motors and vehicles. It is proposed to establish a factory in England and form subsidiary companies in other countries, with the exception of the United States, which is already pre-empted. The English manager will be E. Gascoine, of L. Hollier, Gascoine & Co., Birmingham, England.



MOTOR BUCKBOARD. C. S. FAIRFIELD, PORTLAND, ME.

As a result of the fête and motor exhibition at Spa, Prince Albert, of Belgium, and a number of other distinguished guests on that occasion have ordered motor tricycles and carriages of the French builders.

A foreign contemporary states that the leading French builders of motor carriages are experimenting with horizontal motors in the belief that many of the defects in their vehicles can be remedied by the use of a motor of this type.

De Dion, Bouton & Co., of Paris, are unable to supply the demand for their new petroleum tricycles, which are being sold at 1,600 francs (about $320) apiece. The Bollée tricycle sells at $520.

E. Roger, the well known French motor inventor, is about to organize a company in England to exploit his patents.

The first motor tricycle made in England under Le Comte de Dion's patents, says the *Autocar*, was turned out from the Quinton works of the New Beeston Cycle Company, at Coventry recently. A lot of these machines are being put through and it is only a matter of a very few weeks before a large output will be made.

James Gordon Bennett has subscribed 10,000 francs to the fund for the Paris-Marseilles race. Other subscribers are the Baron de Zuylen de Nyevelt, Count de Dion and the Société Automobiles Peugeot.

We acknowledge the receipt from the author, Rhys Jenkins, London, England, M. I. M. E., of a very valuable little work entitled "Power Locomotion on the Highway," a guide to the literature relating to traction engines, steam road rollers and motor vehicles of all kinds. It comprises a general introduction by the author and a number of carefully classified indexes to authors and articles in this new field of invention. The publishers are William Cate, Ltd., 32 Bouverie Street, London. E. C., and the price is 2s. 6d.

The Bolleé petroleum tricycle, recently described in THE HORSELESS AGE, is creating something of a furor both in France and England. The Beeston Cycle Company will manufacture them in large quantities as soon as the necessary preparations can be made, and it is said that at least one hundred of them, obtained from the inventor, will be exhibited and offered for sale in England within a fortnight.

COMMUNICATIONS.

Progress on the Dey Electric Carriage.

Editor Horseless Age.

In reply to your inquiry, as well as many of your readers, as to how I am progressing with my electric carriage and its hydraulic gearing, I will try to give you an idea how far advanced we are. I enclose some photographs, one of the 2½-hp electric motor, which weighs 65 pounds. The outside case, spider and brush holder are made of aluminum. It is completed with the exception of the commutator connections.

Another picture shows the rear axle, which is made of three pieces of tubing, forming a triangle. At the ends will be noticed the fluid motors connected to the wheel hubs. The latter have not yet been spoked.

The electric motor and pumps go in between the three tubes forming the axle. By loosening a few bolts they can be dropped out, complete in themselves. This arrangement is different from that shown in my original design in the November issue. With this method the running gear is entirely independent of the body, and the latter does not have to be made special.

A third view shows the interior and exterior of the two pumps, which are nearly finished.

The fourth picture shows a miscellaneous collection of some of the different parts.

The plates for the batteries are ready for forming, but we are detained by the rubber companies. We will not be ready in time for the Providence race, but will probably finish in a week or so afterward.

Our wheels will be 32 inches, pneumatic tire (3-inch), wire spokes, and ball bearing.

The steering gear has been changed from the original sketch. The wheels are now hinged near the hub, and are worked by a system which I consider an improvement over the middle fork system used by others, as it is simpler and accomplishes the same result of moving the inner wheel at a greater angle than the outer.

We have had the fluid motors connected up in series, belting to one from the shop shafting, which drives it as a pump. This pumps oil to the other, making it act as a motor. It gave very satisfactory results, with the exception of one time, when the superintendent was beside it, it suddenly slipped its temporary hose connection. The result may be better imagined than described. He received the full benefit of the one-inch stream of oil.

We have not made accurate tests yet, but there is apparently very little friction.

We also tried it with air instead of oil. It did the work, but generated considerable heat on account of the compression.

I expect to use a chemical meter that will take account of the current entering and going out of a battery. In this way I will always know just how much I have left in the battery.

My battery plates are of the Planté type, of very large surface area. I will be able to charge or discharge them in 30 minutes if necessary, and not be afraid of injuring them.

When going on long journeys I will probably carry a jointed fish pole with a spring clip at the end. In case of running short I can spring this on a trolley wire and recharge in a very short time. Of course, I would reimburse the trolley company. I would use a water rheostat to cut down the voltage.

Very truly yours,
HARRY E. DEY.

PAWTUCKET, R. I., Aug. 26, 1896.

Dissatisfied with the Decision of the "Cosmopolitan" Race.

Editor Horseless Age.

You ask me whether I will enter the Providence race. To this question I think I will answer no, as I am suspicious of the good intentions of your organizers of Eastern races after being treated as Mr. Brander and myself were in the division of the prize money of the *Cosmopolitan* race, not even being given our expenses for making the race possible for the Duryea Company, who were awarded the whole prize.

It takes money to express horseless carriages and run them away from home, and it seems to me that no one concern should be allowed to receive the entire prize money, especially when my carriage was the only one that surmounted every hill unaided, as far as it went.

They do these things differently in Chicago. There something like justice was done. Every rig in the *Times-Herald* race received at least enough to pay expenses.

Ten years from now such decisions as this *Cosmopolitan* one may be advisable, but they are entirely wrong in the present stage of the horseless carriage industry.

Truly yours, CARLOS C. BOOTH, M.D.

YOUNGSTOWN, O., Aug. 25, 1896.

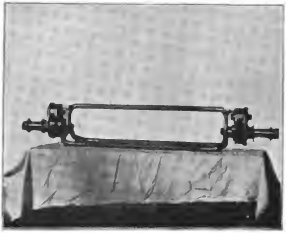
New Factory of the American Motor Co.

The American Motor Co., Havemeyer Building, New York, have removed their factory to Hoboken, N. J., where they have greatly increased facilities. They are running 22 hours a day, turning out three sizes of motors—1½-hp, 2½-hp, and a 4-hp stationary motor. As soon as possible they will furnish all sizes up to 20-hp.

A branch of their business to which they will give special attention is the experimental or designing department, in which they will put into practical shape the ideas of motor inventors who lack the shop facilities and experience to do this unaided. With their corps of draughtsmen and experts in gas engines they are prepared to work out ideas in both transmission devices and motors.

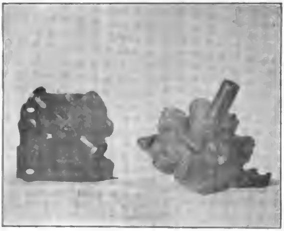
A most interesting feature which they will soon add will be an electric exhibition plant run by a storage battery charged by vapor motors of different types—Sints cycle, Otto cycle, two piston motors, etc.—thus enabling their customers to study to the best advantage all known types of gas engines.

Although vapor motors are their specialty, they are prepared to execute orders for steam motors of compact build and high efficiency. A steam motor which they are now making for agricultural purposes weighs 450 pounds, with boiler, and develops five to ten horse-power.

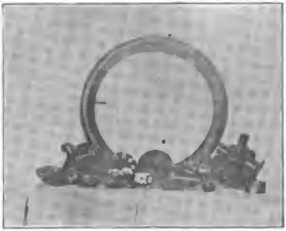


REAR AXLE WITH FLUID MOTORS.

ELECTRIC MOTOR.



THE TWO PUMPS.



MISCELLANEOUS COLLECTION OF PARTS.

Woillard Improved Gas or Vapor Engine.

Eugene P. Woillard, Sugden, Dade County, Fla., has applied for patents on an improved gas or vapor engine, which, it is claimed, utilizes the explosive mixture to the fullest extent and produces a double-acting tandem engine, having a high-pressure impulse in one direction, and a low-pressure or compound expansion impulse in the other, so that every stroke is a working stroke.

The following detailed description is reprinted from the inventor's specifications:

"The invention consists principally of two high-pressure cylinders, and pistons therein receiving alternate impulses; the cylinders being alternately connected at their exhaust with a low-pressure cylinder containing a piston connected with the engine-shaft, so that an impulse is given to the engine at each half revolution of the engine shaft.

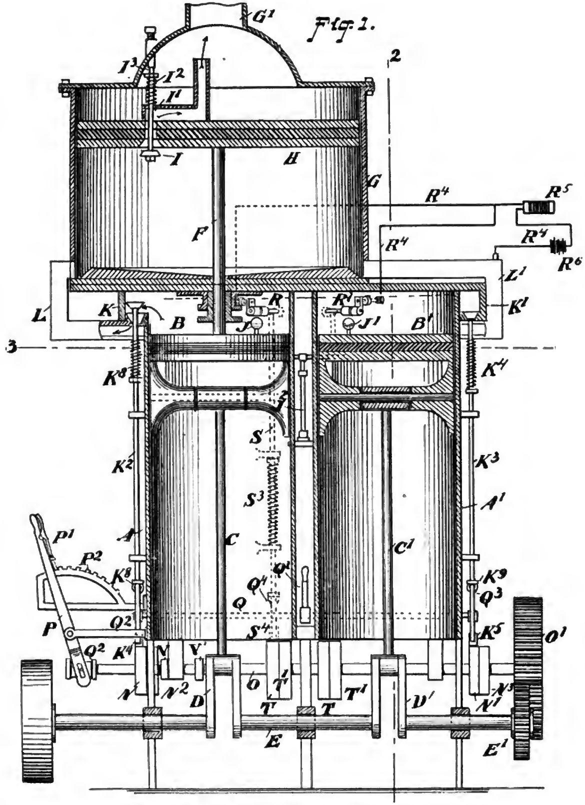
"The invention also consists of certain parts and details and combinations of the same, as will be fully described hereafter and then pointed out in the claims.

"Reference is to be had to the accompanying drawing forming a part of this specification, in which some characters of reference indicate corresponding parts in all the figures. Fig. 1 is a sectional side elevation of the improvement. Fig. 2 is a transverse section of the same on the line of 2—2, Fig. 1.

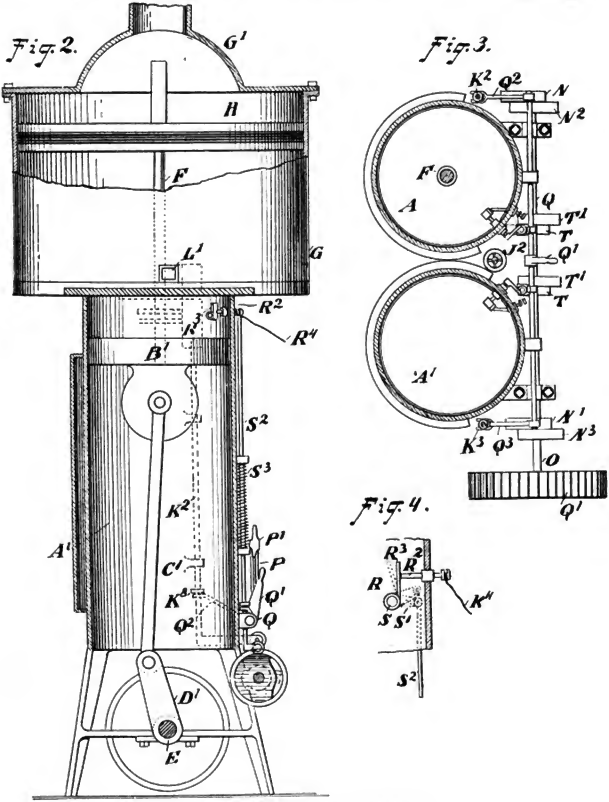
"Fig. 3 is a sectional plan view of the same, on the line 3—3 of Fig. 1, and Fig. 4 is an enlarged transverse section of the igniting device.

"The improved engine is provided with two high-pressure cylinders A and A^1, arranged one along side the other and containing the piston B and B^1 respectively, connected by piston C and C^1 respectively, with crank arms D and D^1 secured to the main driving shaft E of the engine, as is plainly shown in Fig. 1. The two pistons B and B^1, reciprocate in unison, that is they have similar up-and-down movements, but impulses are alternately given to the said pistons by alternate explosions of gaseous mixtures in the upper or working ends of the cylinders, the lower ends thereof being open, as is shown in Fig. 1.

Fig. 1.



GAS OR VAPOR ENGINE. E. P. WOILLARD, SUGDEN, FLA.



GAS OR VAPOR ENGINE. F. P. WOILLARD, SUGDEN, FLA.

"The piston B, in the high-pressure cylinder A, is provided with an upward extending piston rod F, passing through suitable stuffing boxes into a low-pressure cylinder G, containing a piston H, rigidly connected with the piston rod F; the cylinder is in alignment with the cylinder A, and its piston H is provided with an exhaust valve I for connecting the lower part of the cylinder with the top part thereof, at the same time the piston H nears the end of its upper stroke. When the valve I is open, the products of combustion contained in the lower part of the cylinder G can pass to the upper end thereof, and through a smokestack G^1 to the atmospheric air, carrying along with it the residue of burnt gases from explosion in cylinders A and A^1, alternately through passages L and L^1 as the valves K and K^1 are still open to end of the upper stroke. This valve I is normally held to its seat on the piston H, and for this purpose I provide the valve with the valve stem I^1, pressed on by a spring I^2 and adapted to engage a fixed point I^3, held on the smokestack G^1, forming the cover of the cylinder G, as indicated in Fig. 1.

"Now it will be seen that when the piston H moves in an uppermost position, then the stem I^1 is moving against the stop I^3, causes an opening of the valve I, so that the products of combustion in the lower end of the cylinder G can pass to the top thereof and out to the atmospheric air by way of smoke stack G^1.

"In the upper or working ends of cylinder A and A^1 are arranged the automatic inlet valve J and J^1 respectively, connected with a suitable source of gas, vapor or like fluid forming an explosive mixture to act as a motive agent in the working ends of cylinder A and A^1, against the piston B and B^1 to force the same downward. The inlet valve J and J^1 are both automatic, and are opened by suction of the piston B and B^1 respectively; when drawing in their new charges of air and vapor, the valves J and J^1 can be set to admit more or less air and vapor, and for this purpose the valves are held on a vertically adjustable spring piston rod J^2, shown in Fig. 1; the working ends of the cylinders are also provided with exhaust valves K and K^1 respectively, serving to connect the upper ends of the cylinders A and A^1 with the lower end of low-pressure cylinder G alternately to permit the products of combustion from the high-pressure cylinders to pass into the lower end of the low-pressure cylinder G, to act expansively on the piston H thereof so as to drive the latter upwards.

"The valves K and K^1 are opened alternately and positively from the engine shaft E during the whole length of the upper stroke, and for this purpose I provide said valve K and K^1 with valve stems K^2 and K^3 respectively, carrying at their lower ends vertical rollers K^4 and K^5 respectively, having peripheral engagement with cams N and N^1 respectively; fastened on cam shaft O, connected by a large gear wheel O^1, with a pinion E^1 on the main driving shaft E, the shaft O makes one revolution to two revolutions of the shaft E. The cams N and N^1 are arranged in opposite directions relatively to one another so that the cam N opens the valve K at the time the valve K^1 is in a closed position, and the cam N^1 opens its valve at the time the value K is in a closed position.

"Now when the engine is in the position shown in Fig. 1, and the pistons B and B^1 commence their downward stroke then an explosion of the previously drawn in mixture in the working end of the cylinder A^1 gives an impulse to the piston B^1 to rotate the shaft E, and during the downward movement of the two pistons B and B^1, the piston B draws in a new charge of explosive mixtures, and on the return stroke of the pistons this charge in the cylinder A is compressed, the valve K then being closed. During the return stroke of the piston B^1 the valve K^1 is open full length of stroke so that the products of combustion of this cylinder pass through the exhaust channel L^1 into the lower end of the cylinder G, and as the piston H is now beginning its return stroke an impulse is given to this piston in an upward direction by the further expansion of the products of combustion acting on said piston.

"On the next down stroke of the pistons B and B^1 an explosion takes place in the cylinder A to give an impulse to the piston B, and during the down stroke of the piston B^1 a new charge is drawn in through the automatic valve J^1, which is compressed on the return stroke of the piston B^1. During the full length of the return stroke of the piston B the valve K is open by the cam N, so that the products of combustion in the cylinder A can pass through the channel L and cause the products of combustion to act expansively on the under side of the piston H, to give an impulse to the latter in an outward direction.

"Thus it will be seen that an impulse is given to the engine during the down stroke of the piston in either of the high-pressure cylinders A and H^1 and an impulse in an upward direction is given to the engine by the products of combustion acting expansively in the low pressure cylinder G on the piston H. Thus the motive agent is utilized to the fullest advantage, first in the high-pressure cylinders and then in the low-pressure cylinder as above explained.

"If it is desired to reverse the engine I shift the shaft O longitudinally so as to bring the cams N N^1 out of register with the friction rollers K^4 and K^5 and bring the said friction rollers in register with a second set of cams, N^2 and N^3, extending in opposite directions to their mates, N and N^1. By this arrangement the valves K and K^1 are opened and closed in a reverse order.

"In order to shift the shaft O longitudinally I provide on end of shaft O a sleeve, O^2, engaged by a lever, P, carrying a hand lever, P, adapted to lock said lever P in place on a notched segment, P^1. As shown in Fig. 1, the sliding motion of the shaft O is limited by stop collars, V and V^1, on opposite sides of a shaft bearing as indicated in Fig. 1, in order to hold the shaft O in gear with the shaft E. While shifting said shaft O I make the gear-wheel O^1 wider than the gear-wheel E^1 so that upon shifting the shaft the gear-wheels O^1 and E^1 always remain in mesh. In order to hold the valves K and K^1 normally to their seats, I provide springs, K^6 and K^7, coiled on the stems K^2 and K^3 and fretting on collars thereon (see Fig. 1). In order to enable the operator to hold the valves K and K^1 in an open position I provide a shaft, Q, journaled in suitable bearings and carring a hand lever, Q^1, under the control of the operator. On this shaft are secured arms, Q^2 and Q^3, adapted to engage collars K^8 and K^1, secured on the stems K^2 and K^3 so that the operator on swinging the lever Q^1 laterally can cause a lifting of the stems K^2 and K^3, so as to move the valves K and K^1 off their seats.

"It is expressly understood that the exhaust valves K and K^1 are held open during the full length of their up-stroke and the exhaust valve I in low-pressure piston H opens on the latter nearing the end of its "up" stroke, so that while finishing the balance of its stroke up there is a clear passage alternately from the explosion chambers in the upper ends of the cylinders A and A^1 through the passage L and L^1 and through the exhaust valve I in low-pressure out into the stack, so that the residue would be discharged that otherwise would be left in the explosion chamber after the pisons B and B^1 have reached the end of their stroke. This residue, if left, would interfere with drawing in the new charge of air and vapors through the automatic valves J and J^1, as the residue would be under pressure and would prevent the automatic working or opening of the valves J and J^1.

"In order to ensure a proper igniting of the explosive mixtures in the working ends of the cylinders A and A^1, I provide igniting devices R and R^1, held in said cylinders A and A^1, respectively. As the igniting devices are alike in construction it suffices to describe but one in detail.

"Each device, as shown in Fig. 4, is provided with a fixed electrode, R^2, an oscillating electrode, R^3, adapted to make and break contact with the fixed R^2. The electrode R^2 is connected with the outside of the cylinder by a wire, R^4, with a coil, R^5, connected with a suitable source of electricity, R^6, connected by a wire, R^7, with the cylinders or other part of the engine to complete the circuit. The oscillating electrode R^3 is secured on a shaft, S, mounted to turn in suitable bearings on the wall of the cylinder and connected at its outer end by a crank arm, S^1, with a vertically disposed rod, S^2, pressed on by a spring S^3, and carrying at its lower end a friction roller, S^4, in peripheral contact with cam T, fastened on cam shaft O.

"Now it will be seen that when the shaft O is rotated from the main driving shaft, then the two cams T for the igniting device R and R^1 actuate the oscillating electrode R^3 alternately to make and break contact and to cause a spark for igniting the explosive mixtures compressed in the working of the cylinder as previously explained.

"A second set of cams, T^1, is necessary for the friction rollers, S^4, of the two igniting devices for reversing the engine, it being understood that the said cams are arranged diametrically opposite to their mates, similarly to the cams N and N^2 and N^3 and N^4. The positions of the various cams relating to one another are indicated in Fig. 3."

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Entries for Providence Race.

Duryea Motor Wagon Company, Springfield, Mass.; Morris & Salom, Philadelphia, Pa.; W. Lee Couch, New Brighton Pa.; Lewis Brown, Sawkill, N. Y.; P. F. Olds & Son, Lansing, Mich.; Riker Electric Motor Company, Brooklyn, N. Y.; J. Frank Duryea, Springfield, Mass.; Geo. H. Morrill, Jr., Norwood, Mass.; Geo. H. Hewitt, Springfield, Mass.; Fiske, Warren & Co., Boston, Mass.; Wm. M. Ashley & Son, Springfield, Mass.; C. Mayhew & Son, Saratoga Springs, N. Y.

JOIN.... The American Motor League.

Minor Mention.

C. W. Kennedy, an electrical engineer of Rutledge, Pa., has completed an electric carriage that has a number of novel features.

Wm. M. Ashley & Son, who have charge of the exhibition branch of the Duryea business, will show a wagon at the Interstate Fair, Trenton, N. J., Sept. 28 to Oct. 2.

The electric vehicle on which Messrs. Barrett and Perret have been engaged for some months past is nearing completion. Several tests were made in Brooklyn streets last week, and we hope to present our readers with the full particulars in the next issue.

A company called the Horseless Vehicle Company, is said to have been organized at Pittsburg, Pa., to manufacture motor vehicles invented by L. Hisig, a resident of that city. Gasolene will be the motive power. An experimental carriage is being built.

The Coldwell Lawn Mower Company, Newburgh, N. Y., the largest manufacturers of horse-drawn lawn mowers in the country, are preparing to put motors on their mowers. Many a fine lawn is badly damaged by the hoofs of the horse, whenever the necessary work of grass-cutting is done, and the Coldwell Company are satisfied that the motor lawn mower will be hailed with delight by all owners of fine lawns and grass plots.

Wm. M. Ashley & Son, 75 Bay Street, Springfield, Mass., who have the Duryea Motor Wagon exhibit in charge, have booked the following dates:

Hornellsville, N. Y., Aug. 26, 27 and 28; New York State Fair, Syracuse, N. Y., week ending Sept. 5; New London County Fair, Norwich, Conn., Sept. 22, 23 and 24; Danbury Fair, Danbury, Conn., week ending Oct. 10. They are corresponding with other managers of fairs and expect to book a number of other dates for 1896.

SPECIAL NOTICES.

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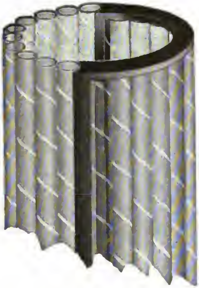

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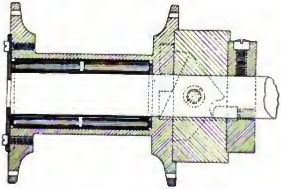

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THE HORSELESS AGE.

A MONTHLY JOURNAL

DEVOTED TO MOTOR INTERESTS.

VOL. I. NEW YORK, SEPTEMBER, 1896. No. 11.

THE HORSELESS AGE.

E. P. INGERSOLL, Editor.

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The Race Track.

The race for motor carriages which came off Sept. 7, 8 and 11, at Narragansett Park, Providence, R. I., while in some respects disappointing, was on the whole a valuable lesson to the promotors of the new industry.

It was disappointing in that the plans of the Fair managers for the accommodation of the vehicles and the thousands who came to see them were not up to the standard of such a first-class attraction. No suitable building was set apart for an exhibition, no signs told the stranger where the carriages were to be seen, and as the electric vehicles were half a mile away from the gasolene wagons, much discomfort was experienced by visitors, particularly during the two stormy days, when the sheds were almost inaccessible. That so many braved the hostile elements and the quagmires underfoot, to get a glimpse of the carriages that run without horses, speaks well for the new vehicle, if not for the management of the Rhode Island Fair.

Another cause for disappointment is found in the fact that only three heats were run instead of five, as originally intended. The weather was the ostensible reason assigned for this premature ending of the motor race, and indeed this would be sufficient cause for the loss of one heat, but it does seem that a race might have been run on Saturday had the managers been so inclined. The chief contestants had determined to outdo their previous performances, and the track was in condition for fast time. Startling figures would surely have been recorded in this final effort, and last, but not least, the amount paid out in prizes would have been somewhat larger.

It was rumored that the horsemen felt jealous of the amount of the purse offered in the motor carriage race, which was considerably larger than any purse they were contending for, and on this account the managers of the Fair preferred to allow the horses to monopolize the track on the last day. However this may be, it is absolutely certain that the Rhode Island State Fair Association secured a leading attraction at a very small outlay, so small, in fact, that had the contestants imagined any such outcome was possible, not one of them would have participated.

And here we come to another cause of embarrassment, namely, the vagueness which has characterized the rules and regulations governing motor races up to the present time. This oversight has already been mentioned in connection with the *Cosmopolitan* program, but the same, or even greater, ambiguity clouds the meaning of the rules of the Providence race. It is safe to assume that not one of the entries knew that the rules of horse racing were to govern the event, nor were they familiar with those rules. Those with whom the editor conversed were not aware that separate entry was required for the exhibition, nor was the clause covering this point as explicit as it should be. These various misunderstandings naturally caused a good deal of dissatisfaction among the contestants, but there is apparently no way to prevent a recurrence so long as motor races are organized and conducted in this haphazard way. A representative organization, like the American Motor League, alone can correct these evils by adopting a reasonable code of rules to govern races and exhibitions, and lending its official sanction only to such enterprises as, in its judgment, will be truly beneficial to the industry.

One subject which will have to be taken up before another race is held, is whether contestants shall be allowed to make changes in their wagons between heats, and to what extent. For example, one of the electric carriages at Providence received an accession of battery every day, until in the last heat the cells were piled up between the seats, and some 60 cells in all were carried, whereas the other electric carriage had only its original supply of battery. This is surely a matter to be regulated, or we shall have stacks of batteries piled up like Ossa upon Pelion, and motor races will quickly sink to the ridiculous.

But notwithstanding the drawbacks above referred to this first appearance of motor carriages in contest upon a race track has been productive of much good. It has established beyond question that the great mass of the intelligent public are deeply interested in the new vehicles, and are eager to see them in operation. Thousands of well-to-do people attended the Rhode Island Fair with the sole object of seeing the motor-carriage race, and hundreds came a considerable distance who never before had entered the grounds.

If the public are willing to pay to see these novel races it follows necessarily that promotors will organize them for the profit to be derived, and inventors and manufacturers will compete in them for the advertisement they receive.

Whether the motor race will take a permanent place in public estimation is a debatable question, nor need it concern us greatly at the present time. As a matter of fact a skilled engineer, by means of any one of half a dozen motive agents, can construct a racing wagon that will beat any record made by a horse, if the track is properly banked on the turns. But even when machines are built especially for racing (as those at Providence were not), and tracks of the most approved pitch are available, it is probable that the limit of speed will soon be reached. Any uncertainty in regard to the performance of a racing machine would then be chargeable to the wilful neglect of the operator or to some unavoidable accident. Unlike horse racing there would be little opportunity for jockeying. But for the present it is sufficient to know that the public is pleased to see a number of motor vehicles going at high speed around a race track. That an exhibition is a desirable accompaniment to a race has frequently been insisted on, and this feature should not be overlooked again. It is a needful corrective for the speed craze.

The chief lesson to be drawn from this Providence race, however, is the need of some representative body to decide the vexed points of general policy, carefully scrutinize all propositions for races and exhibitions, and see to it that motor interests are not sacrificed.

Wholesale Saddlers to Write Down the Bicycle and the Motor.

The Wholesale Saddlery Association, composed of the leading wholesale harness and saddlery dealers of the country, are considerably disturbed over the inroads the bicycle and the trolley car have already made in their trade, and see in the motor vehicle another innovation which bodes them no good. Accordingly they have solemnly resolved to combat the new methods of locomotion. At their last annual convention the president, in his address, alluded to the success which the bicycle manufacturers had had in utilizing the press of the land to create a universal demand for their machines, and suggested that the Saddlery Association should pursue a similar course. He said: "The Wholesale Saddlery Association should employ a man to counteract the articles that are sent broadcast about the decadence of the horse, one who would be capable of writing up something original about the horse, the live, moving thing, wherein every man and woman of taste delights, and a drive behind which sharpens the wits and lengthens life; to contrast this with the dead iron bicycle, that wrings the perspiration from every pore."

Continuing in this vein he endeavored to explain to his hearers how these shrewd bicycle manufacturers had moulded the public to their will, subsidizing physicians, society women, editors of newspapers, etc., until they carried all before them; and the poor horse is now rapidly losing his prestige for want of a champion. A very neat little scheme even if decidedly belated! but there is one flaw in it, and to the business man it is a very important one, for it means the difference between success and failure, and that is that no amount of special pleading can make any considerable portion of the public buy what it doesn't want. The bicycle is a comparatively new means of locomotion. It is true, rivers of printers' ink have been employed in making its merits known to the public, but this work must be regarded as educational. A very small part of this literature has been directly paid for by the manufacturers, the greater part being the natural result of the popularity of the wheel. But so far as the horse is concerned his case is quite different. There is nothing new to be said about him. Poetry and fiction have been filled with his praises ever since the dawn of literature, and if the rising generation, familiar as they are with the animal and his testimonials, are deserting him for more modern methods of locomotion, it must be because they have studied the prose as well as the poetry of the horse, and prefer the bicycle, the trolley car and the motor vehicle.

The gentlemen of the Wholesale Saddlery Association are engaged in a desperate gamble when they back the horse against the bicycle and the motor vehicle.

Better put up your money on the winning side.

The "Motor House" or Caravan.

A correspondent of one of our English contemporaries suggests that the motor might find a field of usefulness in its application to what for lack of a better term might be called nomadics. After assuring us that he he has it on good authority that a gentleman of responsibility and discretion has ordered for himself a motor house, in which he proposes to range the country in search of change and recreation, the contributor passes on to a serio-comic consideration of this novel idea. Two-storied motor houses he thinks rather unsafe for touring. Berths could be provided within to accommodate at least three or four persons, while for those crowded out of the house tents could be set near by. As a means of escaping ground rent he believes the "motor house" will prove a disappointment, unless its owner keeps forever in motion on the road, in which case his plight would be worse than that of the Wandering Jew.

It is quite possible, now that attention has been called to their possibilities, that a limited demand may spring up in England for capacious vehicles, suitable for touring or camping out parties, "caravaning," as it is termed there.

The French Motor Cycle Race.

The race for motor cycles, which took place on Sept. 20, from Paris to Mantes and return, revealed weaknesses of construction in the present French machines which should have been apparent to constructors without so severe a test. The roads were very muddy and slippery, and as the chains and sprockets were exposed to the flying mud and water, the racers were in constant trouble. Chains slipped off and the machinery clogged and hindered progress, not to mention the baptism the unlucky riders themselves received from the wheels.

The Bollée machine, of which so much favorable comment has been heard, showed that it was not fitted for wet weather. The water splashed up and extinguished the flame repeatedly, and the single driving wheel slewed so that the machine toppled over.

Low, exposed gearing is bad enough on dusty roads, but on muddy roads it is simply out of the question. As for the three-wheeled or tricycle style of motor vehicle, the best engineering talent predicts its early extinction, because of its instability. The four-wheeled vehicle is far more safe and firm.

Mr. Richmond on Gas Engines.

We wish to call special attention to the article on "The Gas Engine," by George Richmond, which we reprint by courtesy of the publishers of *Machinery*. Mr. Richmond is one of the acknowledged authorities on this subject in the United States, and any article from his pen is sure to be scholarly and progressive. The authorized translation of "Lieckfeldt's Handbook on the Gas Engine," which is advertised in our book department this month, is also from his pen.

The Gasolene Motor Not Elastic.

In the *Electrical Engineer* for Sept. 30, under the heading of the Providence Race, is a statement which will be challenged by every authority on gas engines. It is said that the gasolene motors in that race, though nominally of 5 horse-power, could be worked up to 10 horse-power. This is a decidedly original view of a gas motor, which, as is well known, is limited to its actual brake horse-power, and when overloaded stops. The electric motor, of course, is elastic, doubling or even trebling its rated horse-power in case of emergency, but the gasolene motor is not capable of this variation, and, in this respect, is at a disadvantage as compared with the electric motor.

Back Numbers Wanted.

Parties having copies of Numbers 1, 2 and 3 of The Horseless Age which they wish to sell or exchange for current numbers, are requested to communicate with the publisher. Those wishing copies of Number 1 to complete their files, and willing to pay a premium for same, should send in their names at once, as the edition is entirely exhausted, and copies can only be picked up at random.

Technical Books for Sale.

On another page will be found a list of technical books on gas and gasolene engines, motor vehicles, etc., either now obtainable or soon to be issued, which we will send to any address in the United States, Canada, or foreign countries included in the postal union. In the latter case a slight extra charge for postage will be made.

An Electrical Authority on Electrical Vehicles.

Commenting on the Providence race, the *Electrical Engineer* says:

"The motor cycle art is certainly advancing, but it would go ahead more quickly if the objects to be aimed at were better understood. There appear to be two classes of vehicles to be worked out, one for long distances, the other for short. In the first category the electric vehicles have no place, and it has yet to be proved that the demand is large enough to make it worthy the attention of electrical inventors. As to the second class, there is little doubt of an early demand, both for pleasure vehicles and for light business and express wagons. But it does seem as though the batteries must be lightened in some way. The weight and space of the battery equipment do not appear to be commensurate with the work to be done or the size of the motors to be driven. On a level country lighter batteries might serve, and in a hilly locality it might be possible to let the motors do a little generating on the down grades. But the present huge masses of battery, said to be good for 50 or 100 miles, mounted high in the air on light running gear, do not strike us as altogether the best outfit for business purposes."

First Meeting of the Great Horseless Carriage Company.

The first general meeting of the Great Horseless Carriage Company, Limited, London, was recently held under the presidency of the Earl of Winchilsea.

The speech of the Earl, in which he explained to the shareholders present the financial status and prospects of the company, is of interest to all students of the new vehicle.

He stated that 4,000 applications for motor carriages had been received and filed, and 750 applications for agencies in various parts of the world.

The capital is £750,000, of which £130,000 is reserved for working capital.

The total subscriptions to the capital had amounted to £650,000, of which the public took £370,000, and the promoter, who had the option of being paid in cash, chose to take £280,000, making £650,000.

The present plant of the company consists of a four story factory building at Coventry, three floors of which are let on short terms to other parties. The ground floor is occupied by the Humber Company, whose Coventry factory was recently destroyed by fire, and who have agreed to turn out for the Great Horseless Carriage Company a number of Bollée tricycles.

On the second floor. E. J. Pennington, in whose motor patents the company is interested, is pursuing further experiments

After the Earl had concluded his speech, Harry J. Lawson, managing director, said he thought the first vehicle to be placed on the market would be the Bollée tricycle, followed by some type of carriage seating four or five people.

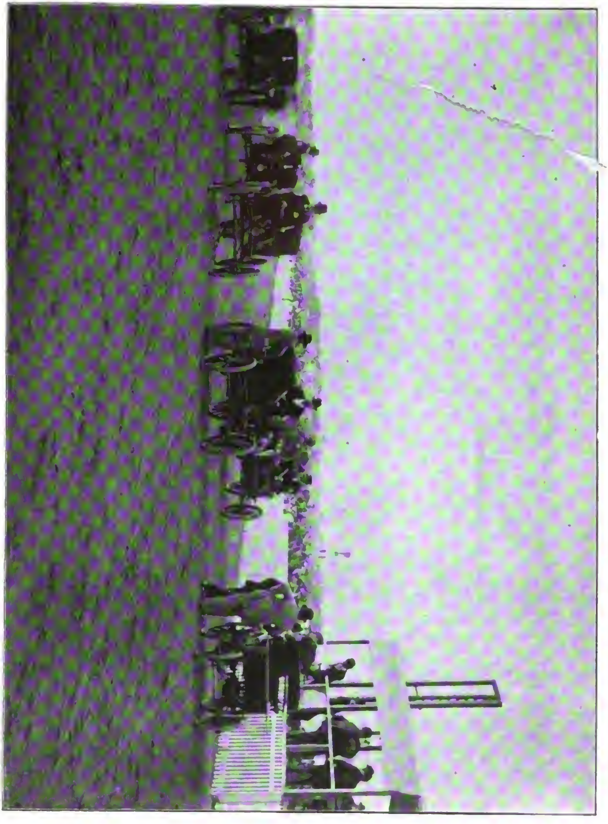
The principal patents held by the company, jointly with the British Motor Syndicate, he said, cost the following sums:

Daimler	£40,000
Bollée	20,000
De Dion	20,000
Other French patents, over	20,000
American patents	100,000

The Daimler patents he regards as fundamental and of growing value.

In November, as soon as the new act is in force, a great sale of motor carriages will be held in London.

JOIN.... The American Motor League.



LINING UP FOR THE START AT NARRAGANSETT PARK, PROVIDENCE, R. I.

The Providence Race.

The motor carriage races advertised to take place Sept. 7th to 11th inclusive, at Narragansett Park, Providence, R. I., in connection with the annual Rhode Island State Fair, commenced on schedule time, but the programme was so seriously interfered with by two days of violent storm that only three out of the five heats proposed were run, the result being a victory for the electric carriages.

Out of the twelve original entries only eight materialized. These were the Duryea Motor Wagon Co., J Frank Duryea, George Henry Hewitt, Fiske Warren, George H. Morrill, Jr., William M. Ashley & Son, Riker Electric Motor Co., and the Electric Carriage & Wagon Co. The last two were electric vehicles, the first being an entirely new one, and the second the "Electrobat," which received the gold medal at Chicago last fall. All the remaining wagons were of the Duryea model, one being entered by the Duryea company and the rest by private purchasers.

The electric carriages arrived several days before the opening of the fair, whereupon their owners began a search for charging facilities on the grounds. No provision for current having been made by the management, arrangements had to be made with a local electric light company, and the only place where the proper connections could be made was a cow shed some distance from the main entrance. Here the electric carriages took their stand, while the gasolene contingent occupied a number of stalls nearly half a mile away. The separation of the vehicles caused great inconvenience to the hundreds who came with the single object of seeing the motor carriages.

No space in any of the buildings had been fitted up for an exhibition and no exhibition of any kind was held, the management claiming that separate entry was required in order to qualify for the exhibition, and that the requisite number of entries had not been received. Consequently no prizes were distributed under this head.

On Monday, Sept. 7th, about 5.30 p. m., the carriages were called upon the track and numbers were assigned to them, as is customary in horse racing.

Each carriage being required to carry a weight of at least 165 pounds in addition to the driver all preferred to take this in the form of an extra passenger, who was either an employee or friend of the owner, or some well-known student of the subject.

The Riker carriage had the pole, the vehicle of the Electric Carriage & Wagon Company secured next position, and the gasolene wagons filled out the row.

All the contestants were sent back some distance behind the post for the start and came up in good order. At the word the electric carriages shot ahead, followed by the entry of the Duryea Motor Wagon Company. The other Duryea wagons were road wagons not geared for high speed, and they fell back from the start. Throughout the five-mile dash the electric carriages gradually increased their lead, finishing close together, the Riker carriage first.

The first Duryea wagon was about three-quarters of a mile behind the winners.

A very strong wind was blowing, and the track, while fast for horses, was too rough and lumpy in parts for motor carriages. The time of the four leading vehicles for the first heat was as follows:

Riker Electric Motor Company	15 min. 1 sec.
Electric Carriage & Wagon Company	15 min. 14 sec.
Durvea Motor Wagon Company	18 min. 47 sec.
William Ashley & Son	20 min. 59 sec.

As this was the first heat ever run on a track between motor vehicles it is reasonable to suppose that the contestants felt new and strange, and could not do themselves full justice. On the second day, however, they gained courage, and determined to improve on the time of the previous day. Both electric and gasolene wagons were carefully prepared for the second event. That of the Electric Carriage & Wagon Company received an accession of batteries, and the cells of both the electric wagons were thoroughly saturated with the powerful fluid.

The Riker vehicle again took the pole on account of its victory in the first heat. The Electric Carriage & Wagon Company were given the second position, the Duryea Motor Wagon Company the third, William Ashley & Son the fourth and so on.

At the word the Riker vehicle took the lead as on the first day, maintaining it to the finish, closely followed by the Duryea wagon and the wagon of the Electric Carriage & Wagon Company.

This heat was closely contested by the three leaders and evoked great enthusiasm from the spectators. The time was a considerable improvement over that of the preceding day:

Riker Electric Motor Company	13 m. 6s.
Duryea Motor Wagon Company	13 m. 13s.
Electric Carriage & Wagon Company	14 m. 33s.
William Ashley & Son	16 m. 31s.

On Wednesday and Thursday a violent northeasterly storm prevailed throughout that section of New England. Rain fell in torrents and the wind played havoc with the shows and with the plans of the management. All races were declared off on these two days, and hundreds of persons who had come from distant parts not touched by the equinoxial gale and could not remain for pleasanter weather, went back disappointed. During the continuance of the storm many showed their interest in the new vehicles by wading through mud and water to the sheds where they were quartered.

On Friday the weather cleared, and by afternoon the track was in good condition. The strong wind which had impeded the racers in the two previous heats had died away, and fast time was predicted. A vast assemblage, estimated at nearly 50,000, had collected in the grand stand and around the track by the time the motor race was called.

Riker took the pole in the third heat; Duryea, second position; the Electric Carriage & Wagon Co., third; Wm. Ashley & Son, fourth; and so on.

The electric carriages dashed off at a two-minute pace, closely followed by the Duryea wagon. A little beyond the half-mile the Duryea wagon was pulling up with the two electrics, when a tire punctured and the wagon gradually lost headway. The Riker carriage maintained its lead until the homestretch was reached, when the other electric spurted ahead and crossed the line a second ahead of its rival. Much better time was made by all the entries in this third heat, scarcely one falling below the 15-mile-an-hour limit. The time of the four winners was as follows:

Elect: ic Carriage & Wagon Company	11m. 27s.
Riker Electric Motor Company	11m. 28s.
Duryea Motor Wagon Company	11m. 59s.
Wm. Ashley & Son	15m. 47s.

The Riker carriage was conducted by A. L. Riker and C. H. Whiting; the carriage of the Electric Carriage & Wagon Company by Henry B. Morris in the first two heats, and by Mr. Adams in the third.

The blood of the contestants was now up, and all were bent on smashing records on Saturday, the last day of the fair. It was announced that two heats might possibly be run, but owing to the large number of postponed horse races, which had to be run off, darkness closed on the track before the motors could be called, and the management announced that the three heats already run would constitute the race. There was considerable grumbling among the contestants, and some of the occupants of the grand stand, when this decision was made known, but no appeal could be made.

The Duryea wagons went overland to Worcester on the following day, and from there were shipped by train to Springfield. The wagons belonging to Fiske Warren and Geo. H. Morrill, Jr., were both run on their own wheels to the residences of their respective owners, the first to Harvard, Mass., and the second to Norwood, Mass.

One of the Duryea wagons made the run to Worcester in three hours, a distance of 47 miles by the road.

The electric wagons were shipped to their destinations as soon as possible.

The race was conducted by the association under the general rules applied to trotting races, and the awards were made upon this basis. The conditions called for a 25-mile race of five heats of five miles each, one on each of the five successive days of the fair.

As unfavorable weather prevented the completion of more than three heats three-fifths of the purse only was divided, in the following proportions: First money, to the Riker Electric Motor Co., of Brooklyn, N. Y., $900; second, to the Electric Carriage & Wagon Co., Philadelphia, Pa., $450; third, to the Duryea Motor Wagon Co., $270; fourth, to Wm. Ashley & Son, Springfield, Mass., $180.

According to the precedent in uncompleted track events two-fifths of their entrance fees were refunded to all contestants not disqualified by failure to attain the required average rate of speed.

Public interest in the motor races in Providence and vicinity was very keen, and quite a number of students of the new method of locomotion came from distant points to witness the trial of speed.

The management of the fair state that they feel amply repaid for their venture.

The electric carriages weighed from 2,200 to 2,500 pounds in racing trim, including passengers, the heavier of the two being that of the Electric Carriage & Wagon Company. The leading Duryea wagon weighed about 1,200 pounds all on.

The fastest mile was covered by the Riker electric carriage, the time being 2.13.

It was quite generally commented on by the audience that the electric vehicles made as much or more noise than the gasolene at high speed.

Prof. W. H. Pickering, of Harvard University, acted as Chairman of the Board of Judges, being assisted by Prof. Alonzo Williams, of Brown University; D. M. Thompson, president of the Corliss Steam Engine Company, Richards Howland, editor of the Providence *Journal*, and ex-Governor D. Russell Brown.

From the Chairman of the Judges.

CAMBRIDGE, MASS., Sept. 20, 1896.

Editor Horseless Age:

Now, that the Providence races are over, and we have had an opportunity to examine and weigh the results, I think we must conclude that some very valuable information has been obtained. Unlike the Chicago and New York competitions, this was a speed contest pure and simple. Only eight vehicles were entered for competition, and therefore, according to the published rules governing the races, no other points were considered by the judges. The comparison between the electric and gasolene carriages was particularly interesting, and the results were quite different from those obtained at Chicago. No electric carriages were entered in the New York contest. While at Chicago the electric carriages were badly beaten at Providence both of these entered came out with flying colors, distinctly in advance of the best gasolene vehicle.

The reasons for this difference are obvious. In Chicago the race lasted several hours, and the course lay over a rough and very difficult track. In Providence, on the other hand, the race lasted but a few minutes, and the course lay over a hard and perfectly level road. Both vehicles, doubtless, have been much improved since the Chicago race; but were it to be tried over again to-morrow we cannot doubt that the result would be the same.

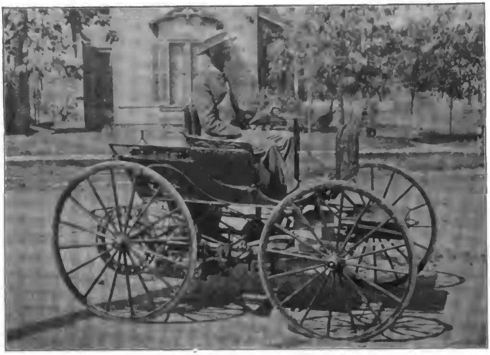
Another point that seemed to me to be of interest was the comparatively low speeds that were at first obtained—low, that is, in comparison with what was claimed for the vehicle before the race, and the rapid improvement made in the successive heats. On the first day but four of the vehicles recorded a speed in excess of 15 miles an hour and none reached a speed of 20 miles, although as compared with common roads the course was an excellent one. Later, much better figures were scored, one of the electric carriages completing a mile in 2 m. 23 s., and one of the gasolene carriages accomplishing it in 2 m. 26 s. One of the electric carriages ran the whole five miles at an average speed of 25.2 miles per hour, while the gasolene carriage reached an average speed of 25.0 miles.

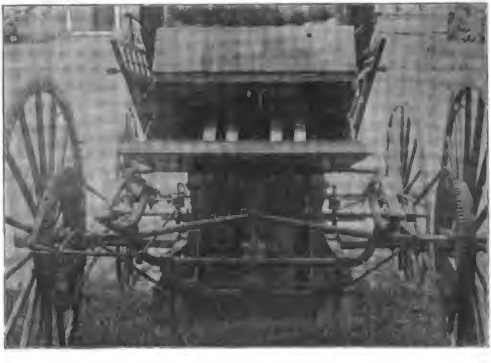
Much public interest was manifested in the races, especially upon the second day, when the competition was very close, and it appears certain that for racing as well as for practical purposes the motor vehicle has come to stay. That before long much higher speeds will be obtained upon the track, as soon as it becomes an object to construct vehicles especially for that purpose, also appears reasonably certain. In the mean time the motor vehicle has conclusively demonstrated that under favorable conditions an average speed of 15 miles an hour is perfectly practicable for ordinary purposes of pleasure travel.

REPORT OF THE BOARD OF JUDGES AT THE PROVIDENCE RACE.

Entries.	Order. Sept. 7.	Order. Sept. 8.	Order. Sept. 11.	Time. Sept. 7. m. s.	Time. Sept. 8. m. s.	Time. Sept. 11. m. s.	Result.
Riker Electric Motor Co.	1	1	2	15 01	13 06	11 28	1
Electric Carriage Wagon & Co.	2	3	1	15 13	13 33	11 27	2
Duryea Motor Wagon Co.	6	2	3	22 59	13 14	11 59	3
Wm. M. Ashley & Son.	3	5	4	18 47	16 31	15 47	4
Geo. Henry Hewitt.	4	4	5	19 31	16 12	15 40	5
Fiske Warren.	5	0	8	20 03		19 00	Disqualified
J. Frank Duryea.	7	6	7	21 23	17 52	18 07	6
Geo. H. Morrill, Jr.	0	7	6		18 19	17 10	Disqualified

W. H. PICKERING.





VERTICAL WAGON MOTOR. DECATUR GASOLENE ENGINE CO., DECATUR, ILL.

The C. V. Walls Vehicle Motor.

C. V. Walls, manager of the Decatur (Ill.) Gasolene Engine Co., sends the illustrations here shown of a carriage for which they furnished a pair of their 4-hp gasolene motors. With the construction of the carriage and the methods of steering and transmitting power they had nothing to do, their part being simply to adapt the motors to the vehicle.

The motors weigh complete 400 pounds. They consist merely of two cylinders, two pistons and two piston rods, one crank-shaft with double bend, four fly-wheels, with bearings and supports for the same. There are no cams, valves, levers, gears, rockarms or other mechanism to get jolted out of time and give trouble. The ignition is by primary battery and spark coil. There is said to be very little wear on the points of contact, and as the little there is can be taken up in a minute the electrodes will last for years without renewing.

The cylinders are each 4-inch bore by 4-inch stroke, and run 600 revolutions per minute, making 1,200 explosions per minute. The cylinders are vertical, the manufacturers stating that their experience proves that with counter-balanced vertical engines there is scarcely a perceptible vibration of the vehicle.

The water tank contains 10 gallons of water, all of which is forced by a pump through the jackets of the cylinders in a continuous stream at the rate of three gallons per minute. This insures against overheating, so that these motors will not get too hot in an entire day's run without resorting to ice or renewing the supply of water oftener than every three or four hours.

"The carriage was built too light," says Mr. Walls, "but as the builder designed it for a 4-hp Kane-Pennington engine, which was guaranteed to weigh only 50 pounds, his error in this direction is pardonable."

The Walls motors are said to propel this carriage at a speed of 15 miles per hour on good roads, and will climb any hill at three miles per hour.

One photo shows the vehicle in profile, the other shows the motors from the rear.

A sudden turn of a street corner caused one rubber tire to roll out, and the photo shows it tied on.

The Bersey Electric Carriage.

Walter Bersey, 39 Victoria Street, Westminster, S. W., England, is the designer of an electric wagon, herewith shown.

The batteries, which are carried in a sliding tray under the seats, are said to be composed of "afluidic" or dry material, so that the cells are practically dry, obviating spilling.

The current is regulated by a driving-switch or lever, which controls both the backward and forward motion.

The time required to change batteries is said to be two minutes, and for recharging two or three hours.

The maximum run on one charge is said to be about 35 miles.

Two motors placed under the back seat above the battery chamber are connected by means of a two-speed toothed wheel gear to each of the rear wheels. This gearing is thrown in and out by a patent clutch.

The speeds are four and nine miles per hour.

Ball bearings are used throughout.

The counter-shafts, which carry the small pinions communicating the power by endless chains to the rear wheels, are universally jointed to automatically compensate for the action of the carriage springs.

Steering is effected by means of a worm-gear, which automatically locks itself in any position.

A pointer shows the position of the steering wheels at all times.

Montgomery Ward's Advertising Car and Carriage.

The electric carriage of Montgomery Ward & Co., the great Chicago department house, whose novel method of advertising was described in our last issue, is attracting a great deal of attention in the towns of Illinois, where it is now being exhibited. The carriage is in charge of Frank Culver, representing the American Electric Vehicle Company, builders of the carriage.

The special car, constructed at a cost of $10,000 to accommodate the vehicle, and those who travel with it, is here illustrated.

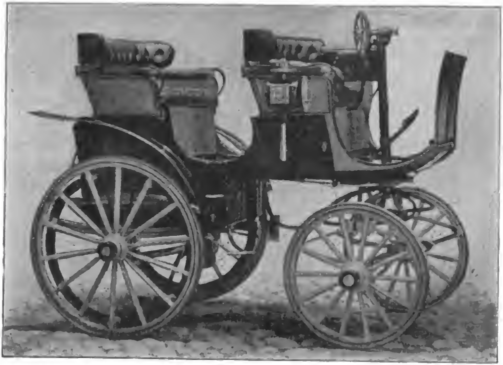
In every town *en route* the carriage is exhibited and run about the streets, and free day or evening concerts and entertainments are given, to the great advantage of Montgomery Ward & Co.

The Motor Cycle Race From Paris to Mantes and Return.

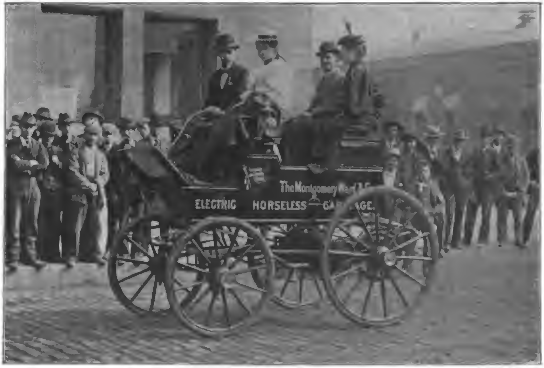
The race for motor cycles, or motor vehicles of the lighter class, was run on Sept. 20, the course extending from Paris to Mantes and return.

The route chosen was difficult enough to put the motor cycles to a severe test, even in pleasant weather, and the ordinary difficulties were intensified by severe rain storms, which covered the road with mud, caused tires to slip, clogged chains and exposed machinery, and brought a number of contestants to grief before the end of the journey of about sixty miles. Besides the dangers and discomforts of the mud, a heavy wind impeded the progress of the machines.

Only four firms actually started in the competition, several having withdrawn or being refused entry on one or another technical ground. The four contestants were: De Dion, Bouton & Co., Michelin & Co., Hurtu-Diligeon and Huzelstein, eight machines in all, though representing but three types—the De Dion, the Bollée and the Hildebrandt & Wolfmuller,



ELECTRIC CARRIAGE. WALTER BERSEY, WESTMINSTER, ENGLAND.



ELECTRIC CARRIAGE. AMERICAN ELECTRIC VEHICLE CO., CHICAGO, ILL.

all of which have been deen described in THE HORSELESS AGE. M. Monin, who had entered a machine of a new type, refused to start because his motor cycle had been improperly classed among those not provided with pedals.

A large crowd, including members of the Automobile Club and English visitors, witnessed the start from the Porte Maillot. Contestants were sent away at intervals of 30 seconds, the tricycle of M. Bollée taking the first place. Next came three of the De Dion tricycles, followed by three Michelin machines of the De Dion pattern and a petroleum bicycle of Hildebrandt & Wolfmuller.

One of the De Dion tricycles soon overhauled the Bollée machine, due probably to the fact that the rider of the De Dion machine was a practiced pedaller.

Just beyond Suresnes a steep hill rose before the racers, which some of the machines had difficulty in surmounting. The tricycles, having auxiliary pedals, were brought to the top by dint of hard pedalling by their riders. The Bollée machine accomplished the grade in a very commendable manner, but the petroleum bicycle was not so fortunate, the rider finding it necessary to jump off and push in order to surmount the grade.

Before St. Germain was reached the mud and water had seriously affected many of the machines, particularly the Bollée, which on account of its low build so exposed the flame in the tube to the splashing water as frequently to extinguish it altogether. The chains also gave a great deal of trouble, slipping off the sprockets and delaying the riders.

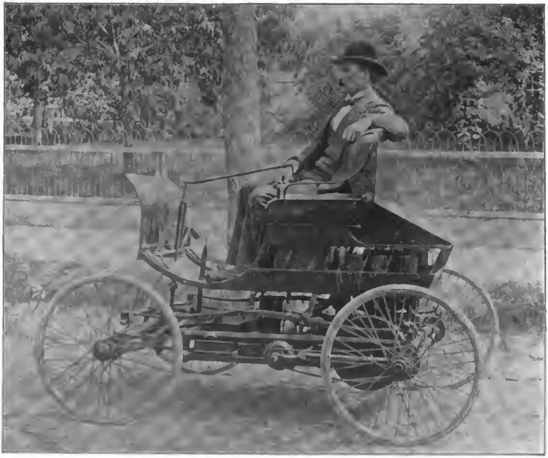
The first machine to reach Mantes was a De Dion tricycle, followed six minutes afterward by a Michelin-Dion tricycle. Four others came straggling in at intervals, the last arriving 34 minutes behind the first. The petroleum bicycle was put out of the race by a collision with a cyclist, and one of the tricycles also came to grief before Mantes was reached. A quarter of an hour was allowed each contestant to lay in a fresh supply of petroleum, after which they resumed their journey to Paris.

On the return several mishaps occurred. The frame of one of the De Dion tricycles broke, but the rider kept on, though in imminent risk of his neck, and came in first at the Porte Maillot. A few seconds later a Michelin-Dion machine passed the gate.

Just out of St. Germain the Bollée machine slipped about on the greasy pavement and finally overturned, slightly injuring the rider, damaging its steering apparatus and deflating a tire.

The best time made was 4h. 10m. 37s. and the slowest 6h. 13m. 30s.

The time was slow, owing to the weather, but the machines being put to a severe test under trying conditions, weaknesses were revealed which will be the sooner remedied.



GASOLENE BUGGY. HAYNES & APPERSON, KOKOMO, IND.

Fig. 1.

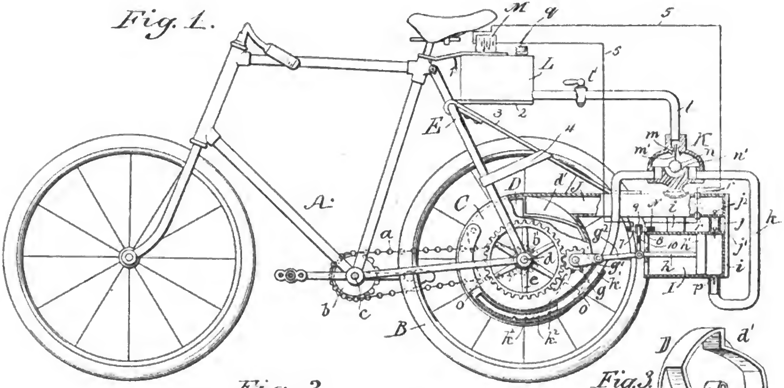


Fig. 2.

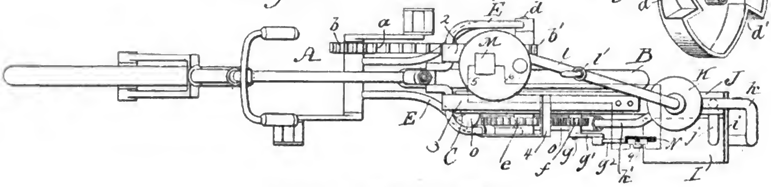
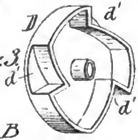


Fig. 3.



MOTOR BICYCLE. SUMTER B. BATTEY, NEW YORK.

Dr. S. B. Battey's Bicycle Motor.

Dr. Sumter B. Battey, of New York City, whose inventions cover a very wide range of thought, has not neglected the now popular subject of motors for road vehicles. A recent idea of his in this line—a bicycle motor—is here presented.

Fig. 1 is a side elevation of the bicycle, Fig. 2 a plan view, and Fig. 3 a revolving cylinder, which will be described later.

An ordinary bicycle is employed, supplied with the usual chain (*a*) and sprocket wheels (*b* and *b'*), the sprocket wheel (*b*) being attached to the pedal spindle (*c*), and the sprocket wheel (*b'*) to the rear shaft (or axle *d*), at one side of the rear wheel (*B*), which is also attached to the shaft *d*.

At the end of the shaft *d* opposite the sprocket wheel b^1 and on the other side of the wheel *B* is attached a pinion *e*, gearing with a driving pinion *f*, of less diameter than the pinion *l*. This latter pinion is journalled to a stud *g*, forming part of a housing *C*, which surrounds a revoluble cylinder *D*, secured to the shaft *d*. This cylinder has pockets or recesses d^1 formed in its outer periphery, adapted to receive a charge of vapor and thus revolve the cylinder

The small stud *g* has attached to it a crank arm g^1 to the outer end of which is pivoted a connecting rod g^2, which connects with a piston rod *h* of a piston h^1, adapted to oscillate within a cylinder *I*, which is attached by braces *i* to another cylinder *J*. These two cylinders are of a size to hold approximately the same number of cubic feet of gas or vapor. Connecting them at a point near their outer ends is a tubular channel *j* which is supplied with valves j^1 and j^2 adapted to automatically open and exhaust the vapor from the cylinder, closing again when the charge is being taken in.

Communicating with the cylinder *I* at a point approximately opposite to the outlet-tube *j* is an inlet-tube *k*, which leads into one side of a vaporizer *K*. This vaporizer *K* communicates with a supply-pipe *l* of a tank *L*, adapted to contain gasoline, naphtha, petroleum or other vaporizable substance, and the supply to the vaporizer is regulated by a stop-cock *l'* attached to the pipe *l*. The vaporizer *K* has an inlet *m* in its upper portion, which is partially closed by a pin *m'*, which rests upon a spherical distributor *n*, adapted to hold portions of the material to be vaporized. Under this sphere is a cup-shaped receptacle *n'*, which will retain any superfluous liquid and prevent the same from being drawn into the cylinder *I* through the tube *k*. Leading into the vaporizer *K* at a point opposite to the outlet end of the tube *k* is a tube *k'*, which telescopes with a tube *o* of a larger diameter. This latter tube pierces one of the walls of the casing *C* and receives a supply of expanded and heated air from the pockets *d'* of the cylinder *D*. The tube *k'* is punctured with apertures k^2, adapted to receive a supply of cold air, which mixes with the hot air discharged from the apertures *d'* of the cylinder *D* before it is carried into the vaporizer *K*, whereby vaporization is accelerated.

The supply-tube *k* of the cylinder *I* is provided at its inlet with a valve *p*, adapted to be normally closed when the vapor is being expelled from the cylinder and to open when it is receiving the supply.

The reservoir or tank *L* above referred to can be secured to the frame *E* of the bicycle by suitable braces 1 and 2 The cylinder *J* and casing *C*, forming part thereof, may also be secured by suitable braces 3 and 4. The tank *L* must also be provided with a screw-cap *q*, which may be removed when it is necessary to fill the same.

The cock *l'* of the pipe *l* leading from said tank is turned on sufficiently to allow a small stream of the substance to flow into the vaporizer *K*, which, owing to the small inlet *m* being partially closed by the pin *m'*, flows very slowly and diffuses over the surfaces of the spherical distributer *n* and vaporizes within the chamber formed by the upper hollow portion of the vaporizer *K*. The bicycle is then started, the operator pedaling in the ordinary manner until the rotary mation imparted to the sprocket-wheels *b* and *b'* and thence to the cylinder *D* and pinions *e* and *f* imparts a continuous oscillating movement to the piston *h* of the cylinder *I*. This piston as it moves back and forth will alternately take in a supply of vapor from the vaporizer *K* through the medium of the pipe *k* and discharge the same into the cylinder *J* through the channel or tube *j*. Immediately upon the completion of the inward stroke of the piston *h*, and when the supply of vapor contained within the cylinder *I* is exhausted into the cylinder *J*, an electrical contact is made and a spark produced within the cylinder *J*, whereby the vapor is exploded, its expansive force being exerted upon the driving-cylinder *D* through the medium of one of the pockets *d'* thereof. This pocket is then exhausted through the pipe *o* and thence through the openings k^1 in the pipe *k* back into the vaporizer *K*. The hot air in transit from the pocket *d'* of the cylinder *D* mixes with a supply of cold air which is drawn in through the open top of the pipe *o*. This mixture of hot and cold air assists vaporization and maintains a continuous supply of vapor to the cylinder. It will be readily seen from the above description that a continuous rotary motion is supplied to the cylinder *D* and thence to the wheel *B* of the bicycle, whereby an even speed can be maintained until the supply of vaporizable material is exhausted, or the operator can stop at his discretion by applying pressure to the pedals in the manner commonly resorted to in the use of all bicycles. The pinion *e* is of a diameter equaling three times that of the pinion *f*, and this will give three revolutions of the pinion *f* to one of the pinion *e*. Thereby a constant supply of vapor is infused into the explosive chamber of the cylinder *J* and continuous and even rotary motion of the motor is said to be maintained.

* * *

Gospel Motor Wagon.

The Rev. E. Knapp, pastor of a New York Baptist church, has been receiving subscriptions for some time for the construction of a gospel motor wagon as a memorial to his father, the late Rev. S. J. Knapp.

It was at first intended that the wagon should be moved from place to place by horses, but since the motor has come so prominently before the public the plans have been changed, and it has been decided to dispense with horses.

On week days Mr. Knapp will himself preach from the wagon, a stage being provided large enough for 10 singers and a folding organ.

The clergyman has not yet decided what motive power he will use.

* * *

Volume I, No. 1.

PARTIES having copies of the November, 1895, number of THE HORSELESS AGE, which they are willing to sell or exchange for later numbers, are requested to communicate with the publisher.

New Pennington Tricycle.

The accompanying cuts and description of the new Pennington motor tricycle, now being manufactured at the Motor Mills, Coventry, is taken from the *Auto-Car:*

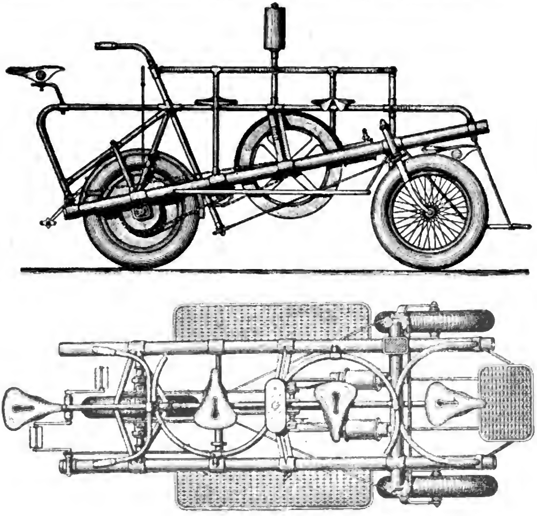
"This tricycle is made to carry four persons, and is the lightest motor vehicle ever constructed for such carrying capacity, weighing under 2½ hundredweights. The width and height are such that it can be run through an ordinary door or stored in a low shed. The motive power is furnished by a two or four cylinder Pennington oil engine, and the speed of the vehicle ranges from 1 to 30 miles an hour.

"As will be seen by the illustrations, the driving is by means of the centrally-placed back wheel, at the hub of which the power is so applied by one lever that the vehicle can be started or stopped at will and any desired speed obtained. It is also fitted with two band brakes. The seating arrangement of the Pennington tricycle is decidedly novel, and the three front seats are made to accommodate either ladies or gentlemen. The person driving the vehicle occupies the back seat, sitting considerably higher than the other passengers, thereby having his carriage under easy control for starting, stopping and steering.

"The engine is started by means of the pedals by the driver after all the passengers are seated, thus obviating any trouble from the vibration when standing, so much complained of in many other types of motor-driven vehicles. The pedal axle is on ratchets, and remains stationary after the engine is started, and has overrun them, so the pedals form a rest for the feet, or, if desirable, can be used to propel the vehicle. A very simple contrivance is used for steering, which is effected from the rear handle bars, an arrangement which is familiar to all bicyclists. Great ease and comfort are obtained by the use of bicycle spring saddles, and owing to the fact that the wheels are fitted with the large diameter non-puncturable Pennington pneumatic tires.

"In its completed form mud guards, wind shields, etc., will be fitted, so as to make it comfortable for use in cold or wet weather."

Mr. Pennington announces that he proposes to challenge the winner of the Paris-Marseilles race.



NEW PENNINGTON MOTOR TRICYCLE.

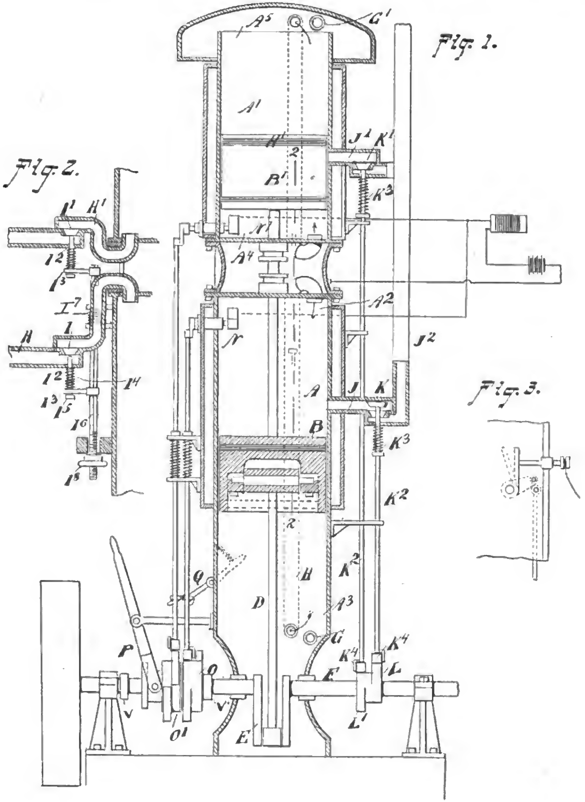


Fig. 1.
A5
G1
A1
H1
B1
J1
K1
K3
N1
A4
A2
N
J2
A
J
K
B
K3
K2
K2
H
Q
D
A3
G
P
O
K4
K4
E
L
V
V
O1
E1
L1
Fig. 2.
I1
H1
I2
I3
I7
I
H
I2
I4
I3
I5
I6
I8
Fig. 3.

Duplex Gas or Vapor Engine of Eugene P. Woillard.

In the previous issue a description was given of a double-acting tandem gas or vapor engine, invented by Eugene P. Woillard, Sugden, Dade County, Fla. In this issue we present our readers with a detailed account of another gas or vapor engine filed in the Patent Office by the same inventor about the same time.

The invention consists chiefly, according to the inventor's claims, of "two high-pressure cylinders, having mixing chambers at the extreme ends and working chambers adjacent to one another, the mixing chambers being connected by valved connections with the working chambers, and pistons moving in unison in said cylinders and receiving alternate impulses by the explosion of the mixtures in the working chambers of the cylinders."

Fig. 1 is a sectional side elevation of the improvement.

Fig. 2 is a transverse section of the inlet valves.

Fig. 3 is a transverse section of one of the igniting devices.

The improved engine is provided with two high-pressure cylinders, A and A^1, arranged in alignment with one another and containing the trunked pistons B and B^1 respectively, connected with each other by a piston-rod, C, passing through suitable stuffing-boxes in the adjacent heads of the cylinders A and A^1. The piston B is connected by a pitman, D, with a crank-arm, E, on the main driving shaft F, it being understood that the pistons receive alternate impulses, to impart a continuous rotary motion to the shaft F. The cylinder A is provided with a working chamber, A^2, arranged in the upper end of the cylinder, and with a mixing chamber, A^3, arranged in the lower end of the cylinder and containing an automatic valve inlet, G, through which passes gas, air or other medium forming an explosive mixture. The cylinder A^1 is provided at its lower end with a working chamber, A^4, and at its upper end with a mixing chamber, A^5, into which leads an automatic valved inlet, G^1, for supplying the cylinder with the medium for forming the explosive mixture. The chamber A^3 of the cylinder A is connected with the working chamber A^2 with a pipe or channel, H, and a similar pipe, H^1, connects the two chambers A^5 and A^4 with each other. In the pipes H and H^1 are arranged the valves I and I^1 respectively, adapted to be set to admit the desired amount of explosive mixture to the working chambers of the cylinders, according to the speed at which the engine is intended to be run. For this purpose each of the valves I and I^1 is provided with a valve-stem, I^2, loosely engaged by an arm, I^3, pressed on by a spring, I^4, coiled on the stem I^2.

The lower end of the latter is provided with a nut or collar, I^5, to limit the upward sliding motion of said valve-stem I^2 and regulate the opening of the valves I or I^1. The arm I^3 for the two valves I and I^1 are secured on the same square rod I^6 fitted to slide vertically in suitable bearings arranged on one of the cylinders, as plainly shown in Fig. 2, said rod being normally held in position by a suitable spring, I^7.

On the threaded end of the rod I^6 screws a nut, I^8, for moving said rod up and down to give more or less play to the valves I and I^1, and regulate the opening of the valves so as admit more or less explosive mixture to the working chambers of cylinders. The cylinders A and A^1 are provided with exhausts or outlets, J and J^1, arranged at or near the middle of the cylinders, and provided with valves K or K^1 respectively held on valve-stems K^2, pressed on by springs K^3, to hold the friction rollers K^4 journaled in the lower ends of said stems in peripheral contact with the cams L and L^1, secured on the main driving shaft F. The cams are so arranged as to suddenly open the valves K and K^1 at the same time the crank E is passing its dead centre, as is plainly shown by valve K in Fig. 1, to permit a rapid discharge of the products of combustion through said exhausts J and J^1 into a common exhaust pipe J^2 leading to the atmosphere.

In the working chambers A^2 and A^4 of the cylinders are arranged electrode igniters N and N^1 respectively, preferably of the construction shown and described in detail in my application for letters patent of the United States of even date herewith. The igniters N and N^1 are actuated by cams O and O^1 respectively, mounted to turn with and slide on the main driving shaft F, and adapted to be shifted on said shaft against either of the fixed stops V or V^1 by a hand lever P, to permit of reversing the engine whenever desired, it being understood that said cams O and O^1 are made double for accomplishing the desired result. The igniting device may also be set out of action by a suitable hand lever, Q.

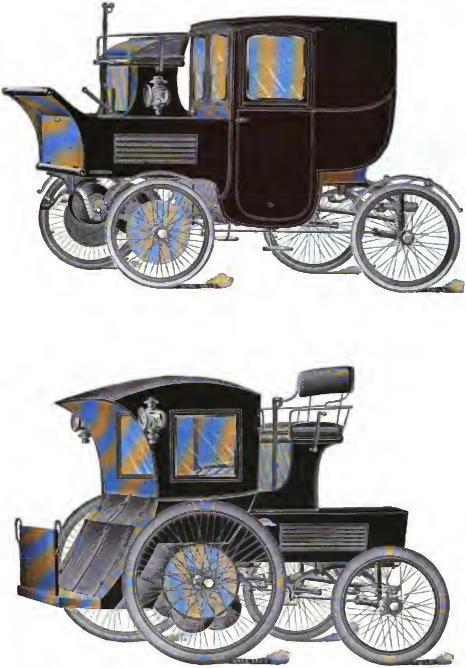
The operation is as follows:

When the pistons are in the positions illustrated in Fig. 1 said pistons are on the up stroke, and at this time an explosion takes place in the working chamber A^4, to give an impulse in an upward direction to the piston B^1. When this piston B^1 is at the end of its stroke and the crank E is on its upward dead centre, then the valve K^1 is suddenly opened by the action of the cam L^1, to cause the products of the combustion to pass through the exhaust J^1 and the open valve K into the exhaust pipe J^2, leading to the outside. At the same time the valve I^1 in the pipe H^1 is relieved of the pressure caused by the explosion, and consequently the mixture of gas and air in the chamber A^5, previously drawn into the same, passes through the pipe H^1 into the working chamber A^4.

During the up stroke of the piston B the explosive mixture is drawn in through the valve G, and at the same time the explosive mixture previously passed into the working end of the cylinder is compressed: and when the pistons B and B^1 are on the return or down stroke, then an explosion takes place in the chamber A^2, to give an impulse to the piston B in a downward direction.

When this takes place the valve K is suddenly opened by the action of the cam L just at the time piston B has reached end of stroke and the crank E is on its lower dead centre, as is shown in Fig. 1, causing a discharge of the products of combustion from the working chamber A^2 of the cylinder A. By this reduction of pressure in the working chamber A^2 the valve I in the pipe H is relieved, and consequently the previously drawn-in mixture in the chamber A^3 passes by the pipe H into the working chamber A^2 past the valve I. On the down stroke of piston B^1 the mixture previously drawn into the working chamber A^4 is compressed, and this mixture is ignited at the beginning of the next up stroke of the pistons B and B^1.

During the down stroke of the piston B^1, however, a fresh quantity of explosive mixture is drawn into the chamber A^5 by the automatic valve inlet G^1. The above-described operation is then repeated; that is, a full impulse is given to each piston, but alternately on each full revolution of the main driving shaft F, and consequently a continuous rotary motion is imparted to said shaft. The pistons B and B^1 are preferably both trunk pistons and made sufficiently long to cover the outlet or exhaust ports with the trunk end.

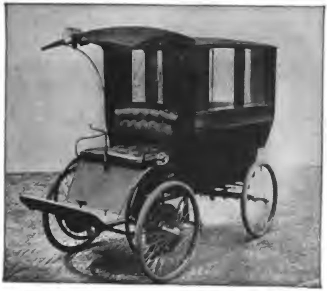


COUPE AND HANSOM.—ELECTRIC CARRIAGE & WAGON CO., PHILADELPHIA AND NEW YORK.

New Vehicles of the Electric Carriage and Wagon Company.

The Electric Carriage & Wagon Company, New York and Philadelphia, are now constructing several new types of vehicles, which they expect to put into service in New York about Nov. 1, increasing the number as time and experience warrant.

They are not attempting at present to fill individual orders for carriages in various parts of the country, as they consider such a scheme impracticable, but are confining their attention to building a number of electrical hansoms and coupes for public service in New York City and Philadelphia. When they have demonstrated the commercial success of a system of this kind, they believe it will be an easy matter to establish stations in every large city of the Union, where a private individual who desires a carriage can have it properly charged and cared for. An indiscriminate putting forth of such vehicles they regard as unwise, because it would be impossible for them to send a skilled engineer out with every carriage they sold, and the average layman knows nothing about the electric business.



These vehicles will have a capacity of 25 or 30 miles on one charge over ordinary city streets and roads, and the cost of operating when power is supplied by the owner, and not from the Edison station, is claimed to be not more than 50 per cent. per day, including renewals of batteries and necessary repairs on the vehicle.

The vehicles are each supplied with two 1½-hp Lundell motors and 44 chloride accumulator cells of a special type designed for this work. All have the rear steering device seen in the original "Electrobat."

* * *

Helical Gears for Motor Vehicles.

In the search for a suitable method of transmitting power in motor vehicles many different forms of gears have been tried with varying success. One of the most recent to come under the notice of the motor expert, and perhaps the most promising, is the helical gear, now considerably used in England in mill machinery, and to some extent in this country.

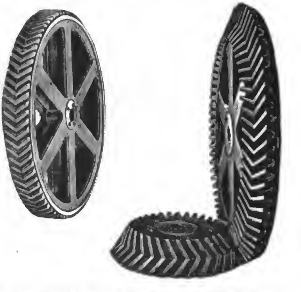
The advantages of this form of gear are described by a leading engineering authority as follows:

"The helical gear is a screw gear, invented by Dr. Hooke, well known in connection with 'Hooke's Coupling' or Universal Joint. As illustrated, it is composed of many numbers of 'right' and 'left' screw threads, joined in the central plane of the wheel. The advantages of such teeth over ordinary straight teeth (which are, in fact, helical teeth with infinite pitch) in gear wheels, together with the explanations of such advantages are as follows:

"Greater strength for same section of teeth; first, by reason of the support derived from the angle at the junction of the halves (which should always be accompanied by the 'shrouding' of the outer ends of the teeth); second, by reason of the fact that the strains are applied gradually from a point at the commencement of contact to full helical bearing lines when the angle of the tooth has reached the bottom of its space, and gradually released from this full bearing line to the points of contact, one at each end of the teeth, as they part.

"The contact between the teeth being always a common helix, it follows that there is no sliding of one tooth over the other, thus eliminating one usual cause of destruction and loss of power.

"The gradual making of contact, as compared with the instantaneous contact along a line extending over the whole width of the tooth (being that which takes place in the ordinary gear), also explains another advantage—that of comparative noiselessness.



"To reap the full advantage of this form of tooth in strength, a pair of these gears should run together with apices of their tooth angles in advance; and if they are required to run at intervals, in opposite directions, they should, if possible, be so mounted as to have their hardest or longest service performed when running, as above indicated. For heavy drives, in reversing actions, as in some rolling mills, two similar pairs of wheels are placed alongside each other with apices in advance in opposite directions.

"Another precaution to be observed in the mounting of helical gears, that is not necessary with ordinary gears, is that one of each pair of meshing wheels should be free to move slightly longitudinally on its shaft, in order to automatically secure the absolute identity of the middle planes of the two meshing gears, an essential to proper working.

"The greater strength and better wearing qualities of these teeth, or in other words, the fact that lighter gears may be used for equal strength and duration, coupled with the entire absence of sliding friction, and with their comparative noiselessness, would seem to make these gears especially desirable for power transmission in motor vehicles.

"On the other hand, their use for varying speed requires some clutch mechanism for its accomplishment, as they cannot be thrown in and out of gear by longitudinal shifting as employed with ordinary gears (as for example, in Peugeot's carriage, described in the April issue of THE HORSELESS AGE); and they are besides, more expensive when properly cut (the only condition in which they should be introduced) than cut gears of the ordinary type.

"It is believed that these gears were first introduced in motor vehicles on the 'Gladiator' tricycle, tandem bicycle and motor carriage (see June HORSELESS AGE) exhibited at the 'Salon du Cycle,' 1895, Paris, where cut bronze helical gears were displayed."

W. Lee Crouch's New Carriage.

W. Lee Crouch, New Brighton, Pa., one of the entries in the Providence race states that the carriage on which he was engaged could not be completed in time for the event. It is arranged to carry four persons, and is propelled by two gas motors, having 5½ x 8 inch stroke, and consuming either kerosene or gasolene as fuel.

Mr. Crouch is preparing to manufacture a very light motor which he will sell to builders of motor vehicles.

The McMurtry Steam Carriage.

A. L. McMurtry, Chester, Pa., has recently constructed a steam pleasure carriage for a party in Allegheny, Pa. The boiler, which is of 1½ horse-power, is placed back of the seat, and two ¼-hp engines are placed under the seat. The fuel is gasolene, the tank holding enough for a four hours' run.

Two levers only are required to operate the carriage, which, the designer says, has been tried and found satisfactory.

The engines will soon be replaced by two 1-hp compound engines.

The above vehicle is only experimental, and Mr. McMurtry intends to make "the one" next spring.

The King Motor.

The King motor, shown in the accompanying cut, is especially designed for vehicles, and is undoubtedly one of the simplest and most efficient motors yet produced for the purpose.

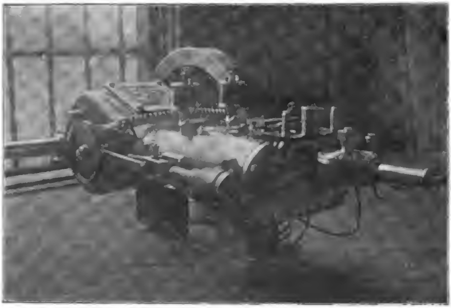
No carburetor or gasolene pump is employed.

All of the working parts are large and of ample proportions. The motor is capable of making extended runs without attention.

Its weight, complete with fly-wheel, is 230 pounds, and it develops over three and one-half actual horse-power at the brake. A signal whistle is added for the convenience of the motorman.

In our next number we hope to illustrate a carriage operated by one of these motors.

Charles B. King, of 112 Antoine Street, Detroit, Mich., is the manufacturer.



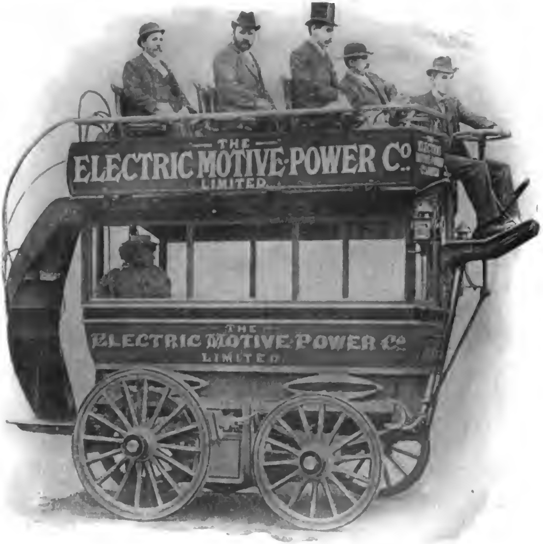
WAGON MOTOR.—CHAS. B. KING, DETROIT, MICH.

Electric Bus of the Electric Motive Power Company.

The Electric Motive Power Company, 16 Elm Street, Gray's Inn Road, London, W. C., England, have been conducting experiments with motor buses for some months past. They have advanced far enough in their experiments to put an electric bus into thorough practical test in the outlying districts of St. Albans and Hatfield with very satisfactory results.

To facilitate changing four batteries are used, and as each set is placed in the chamber it automatically couples up with the next by means of spring cone couplings. Thus only 375 pounds of batteries have to be handled at one time.

The batteries are moved about on telescopic trolleys, which convey them to the vehicle and elevate them to the height of the chamber. So well are the batteries insulated from vibration by a system of springs on which the vehicle is hung that it is claimed no acid has ever been spilled, though the acid comes to within half an inch of the top of the cells.



The following cut and description of this bus is taken from the *Autocar*, our English motor contemporary.

According to this authority the vehicle has accommodations for 26 passengers and weighs nearly 5,000 pounds.

The storage batteries are of a new pattern made by the Epstein Company weighing 1,500 pounds and adapted to be easily removed and a re-charged set substituted. The power stored is said to be sufficient to last over any ordinary route.

Owing to a patented system of double suspension the bus is much easier to ride in than the average horse-drawn vehicle.

Little effort is said to be required in steering, this having been accomplished with a lever only 13 inches long.

The machinery makes no perceptible noise.

Speed can be regulated from 1 to 10 miles an hour, and in case of emergency the bus can be stopped within its own length.

Special gear is used to enable the vehicle to ascend heavy grades. This gearing is contained in a dust-proof box about a foot long and runs in oil.

Both inside and outside electricity is employed in lighting.

The cost of the electricity is said to be 2 pence a mile run at 4 pence per Board of Trade unit.

Without change in general design, the vehicle can also be run by an oil motor, also sold by this company, using kerosene as fuel.

The Electric Motor Power Company do not intend to run buses for public service, but to sell them to proprietors of lines and companies.

More About the Bollée Tricycle.

In the May number of THE HORSELESS AGE we presented a general description of the now famous Bollée tricycle. Thanks to *La Locomotion Automobile*, we are now able to add a few particular points in regard to its mechanical construction.

As only one driving wheel is employed, no differential gear is required.

Steering is accomplished by means of a pinion and gear.

Starting, changing speed and applying the brake are all effected by one lever operated by the conductor's left hand.

The front or steering wheels are pivoted at the hub.

The motor has radiating ribs instead of a water jacket, resembling in this respect the tricycles of the Gladiator Company and De Dion, Bouton & Co.

A horizontal tube, *d*, supports the lever, *f*, which by a pinion and gearing, *cC*, controls the steering wheels.

A system of U-shaped tubes supports the driving wheel, *d'AR*.

The wheels, which are of wire and have tangent spokes, are fitted with large Michelin pneumatics.

The intermediary shafts *E* and *I* carry the speed changing gears, giving speeds of about 5, 8 and 15 miles an hour. The lowest speed will easily carry the vehicle up a 10 per cent. grade.

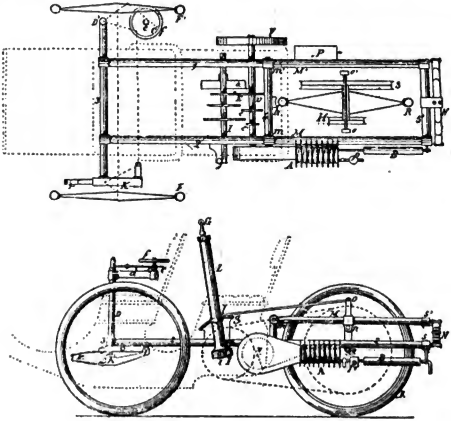
The motor is placed laterally, so that all its working parts may be easily accessible, and it is not necessary to get out of the vehicle to start it, a lever on the side being provided for this purpose.

The belt transmission is employed between the pulleys *S* and *s*. Tension, which can be varied at will, is secured by a simple movement of the speed-changing mechanism, and the adhesion is said to be perfect.

H is a brake pulley.

The cushions in the seats are filled with springs to increase the comfort of riding.

One of the chief merits of this vehicle is said to be its stability, due to the size of the triangle of its base, to its low centre of gravity, and to the solidity of the steering wheels in front.



MECHANICAL DIAGRAMS OF BOLLÉE TRICYCLE.

Foreign Notes.

Over 40 members of the Motor Car Club attended the Paris-Marseilles race.

Attempts are to be made to use motor wagon trains for the haulage of merchandise between Liverpool and inland cities.

The Roger Company are reported about to commence the manufacture of their motor carriages at Birmingham, England.

Prof. A. Atkinson, of the Glasgow, Scotland, School of Technology, is about to issue an elementary treatise on gas engines.

The *Petit Journal* says that four companies are being organized at Paris to introduce motor cabs in competition with the horse vehicle.

The price of motor cycles which are being turned out by the New Beeston Cycle Company, of Coventry, England, is reported at about $300.

The Brittania Company, Colchester, England, are at work upon a new variable speed gear for motor vehicles, which dispenses with belts and gear wheels.

A company is about to be formed in Birmingham for the manufacture of the Wilkinson pneumatic hub. This inventor is also engaged upon an oil motor.

Peugeot Freres declined to participate in the Paris-Marseilles-Paris race, on the ground that they were satisfied with their past performances, and already had all the business they could handle for the present.

H. J. Lawson, the "motor king," has offered £1,000 for the two leading carriages in the Paris-Marseilles-Paris race, provided they be delivered to the British Motor Syndicate as soon as possible after the event.

The town council of Dover, Eng., recently took up the subject of motor wagons for street cleaning, with the result that a proposed increase in horses was postponed pending further investigation of the new vehicle.

In Paris both drivers of horses and operators of motor vehicles are now required to carry certificates given by a commission of coachmen or engineers to those who show themselves qualified to be entrusted with them.

On Nov. 14 a tour or parade of motor vehicles from London to Brighton and back will be held by the Motor Car Club in honor of the enfranchisement of the motor road vehicle, that being the date when the new law goes into effect.

An English contemporary says: "Mr. Pennington is getting talked of with a considerable amount of sarcasm, and people are asking why he does not propose to go over to France and have a race with them instead of issuing another American challenge."

Harry J. Lawson, of the British Motor Syndicate and the Great Horseless Carriage Company, has been christened by the French "King of the motor vehicle industry." Perhaps in return for this compliment he has offered to the winner of the Paris race a magnificent silver trophy, to be known as the British Motor Trophy.

Owing to the general protest raised by builders, inventors and motor students against the decision of the committee of the Automobile Club to hold no exhibition of motor vehicles in connection with the Paris-Marseilles race this year, the committee has reversed its decision and will hold a show of the competing vehicles in the Palais de l'Industrie.

The Parisian promoters of the motor cab mention, among the benefits which they expect to derive from the disuse of horses, immunity from strikes. When a strike breaks out among their employees now, the company cannot long hold out, because its horses are eating their heads off, and are suffering from lack of exercise. The motor cab would be practically free from expense when not in use.

From Scotland comes the announcement of a new electric carriage for two persons, which weighs only 350 pounds, and is capable of a speed of 12½ miles an hour. "The power is supplied by 20 of McDonald's patent cells, which supply 25 amperes at a pressure of 25 volts to a ¼-hp electro motor. Each cell weighs eight pounds when fully charged. As these cells only require to be charged with salt water, and as each charge suffices for a 15 hours' run, the cost is only one-third of a penny per mile." The builders of this marvelous carriage are McDonald Brothers, of Strathtay.

A good deal of complaint has been made by owners of motor carriages in Paris about the irregularity and unfairness with which the tax on petroleum in use for motor carriages has been levied. Some of the officials paid no heed to the motor carriages, either leaving or entering the city, while others compelled the owners to pay both ways. Owing to the efforts of the Touring Club this lax method has been superseded by a uniform rule. On leaving the city the amount of petroleum is registered, and on the return additional tax is not levied unless the amount of petroleum exceeds that registered on leaving.

The Paris-Marseilles-Paris Race.

On the morning of Sept. 24 30 motor carriages out of 45 entries started from the Palace at Versailles at stated intervals *en route* for Marseilles, in competition for the prizes offered by the Automobile Club. Ten days will be required to finish the journey, which is nearly 1,000 miles both ways. No contestant is permitted to travel by night, parks for the vehicles being provided in the different cities where stops will be made.

A full account of this race will appear in the next issue of THE HORSELESS AGE.

Motor Company Organized in Montreal.

The Moto-Cycle Company, of Canada, Ltd., has just been organized in Montreal to manufacture and sell in the Dominion motor vehicles and motors for agricultural implements, which are in great demand in the Northwest. The capital stock is $150,000, and the directors are Raymond Préfontaine, Capt. Charles Joseph Quesnel Coursol, John N. Hickey, Terence Francis Moore and Charles Lionais, the last named being managing director.

They expect to have a factory in operation in about two months.

The Gas Engine.

GEORGE RICHMOND.

The term "hot air engine" is by common consent restricted to a certain class of machines, which to-day possess little more than a historical and academic interest. This is rather unfortunate, since we need the term to describe a whole class of engines which have succeeded the hot air engine and to a great extent realized the expectations so sadly disappointed by it.

For the gas engine, gasolene engine and oil engine are all species of hot air engines. In each case heat is the motive power, and the transformation of heat into work is effected by the heating and cooling of air, as an agent.

The only essential difference between a steam engine and a gas engine is in the agent used, vapor in one case and air in the other. The general theory is the same for each, and contrary to current belief the subject is one of extreme simplicity. Putting aside the prejudice inspired by pre-conceived ideas, and a little perhaps by the phraseology employed, it will be found that the problems of thermo-dynamics required for an elementary, but adequate, study of heat engines are as easy of solution as measuring up a piece of work with a foot-rule.

GEORGE RICHMOND, M. E.

We cannot afford to ignore these questions; if we regard the gas engine simply as an ingenious piece of mechanism we shall miss some of the most significant features of the subject.

As a heat engine the gas engine enjoys the distinction of converting into work a greater percentage of the heat supplied to it than the best steam engine does. This important fact had no particular significance in the earlier applications of gas engines. They were adopted on account of their convenience, and even to-day are regarded by many as a poor apology for a steam engine. It must be admitted indeed that the ordinary gas engine is lacking in the adaptability and elegance of the high-grade modern steam engine. The fact, however, that the possible efficiency of the gas engine is greater than that of the steam engine is ever expected to reach, has forced the gas engine into prominent rivalry with the steam engine, and stimulated the study of its principles and means of improvement.

An infinite variety of gas engines has been described and many constructed, but the only type practically in use at the present time is that invented by Dr. Otto. In the course of a tedious lawsuit, evidence was unearthed that the cycle of operations used by him had been previously most minutely described by Beau de Rochas.

It seems improbable that the mechanical world would ever have profited by De Rochas's ideas unless some one had re-invented them and put them into practical shape, and Dr. Otto seems to be entitled to the full credit of having done this.

It is not asserted that the "Beau de Rochas" or "Otto Cycle" is the only practical one for a gas engine, or even the best. It is significant, however, that a number of ingenious arrangements claiming distinct advantage over the Otto cycle were promptly abandoned on the expiration of the Otto patents. The defects of this cycle are apparent, and probably nearly every student of the gas engine has some pet scheme for improving it. A consideration of the earlier types, marking the period of evolution, will be very instructive, and hardly less so the latter designs when ingenuity was stimulated by the desire of sharing the profits made by the owners of the Otto patents as much as by the hope of producing a superior engine.

Our present business is with the Otto cycle itself. Beau de Rochas described it as early as 1862, as follows:

I. Suction or drawing in of the charge during the outward stroke.

II. Compression during the return stroke.

III. Ignition at the dead point, followed by expansion during the next outward stroke.

IV. Exhaust of burnt gas during the second return stroke.

These operations require for their completion two revolutions of the engine, and the power is applied during one-fourth only of this period, namely, the second forward stroke. During this period work has to be stored up sufficient for the useful and frictional work of the next three strokes, together with the work of compressing the mixture.

This is one of the most serious drawbacks of the gas engine. To ensure regularity great reservoirs of stored work in the form of flywheels must be provided, and to ensure durability, the gas engine should be at least four times as strong as the steam engine of the same power. If we wish to utilize the parts of a steam engine to construct, say, a 10-hp gas engine, we should select the crank shaft, framing, etc., from at least a 40-hp engine.

It is notorious that proportions and rules firmly established by the best steam engine practice are totally ignored in many gas engines, and to this fact may be attributed the want of confidence which the gas engine by no means merits *per se*.

As to regularity, it is easy to adjust the fly wheels to give less than the stipulated maximum of variation, provided that the cycle of operations be faithfully carried out. If, however, a misfire occurs, the work of four complete strokes has to be taken out of the flywheels, and restored again, before normal conditions are reached. Regulation under a variable lead is effected in a variety of ways, by complete cut out of power stroke or by diminished force of explosion, which last result is obtained either by weakening the explosive mixture or by reducing the compression.

This compression in the second stroke is apt to be regarded as lost work. We shall find, however, that the striking superiority of the Otto engine over its predecessors is almost entirely due to the compression prior to ignition. By its adoption the gas consumption was reduced from 60 to 25 cubic feet per horse-power per hour, and the simplest way of obtaining a further economy is by increasing the compression. In our next chapter we shall consider the kinematics of the gas engine and the mechanical devices for producing the motions required by the cycle.

CHAPTER II.

The indicator is an instrument so well understood that it is not necessary to describe it. For furnishing an autographic record of the changes of volume and pressures within the cylinder and consequently the work done it is an admirable contrivance. Knowing beforehand precisely the changes we wish to produce for the four-stroke cycle of the gas engine, we can construct the diagram representing them. Such a diagram is that represented in Fig. 1. Commencing with the compression at the point marked 1 we have :

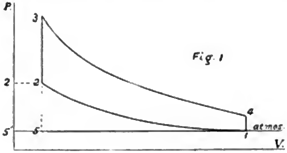


Fig. 1

First Stroke.—5 to 1, during which the explosive mixture is drawn into the cylinder through the open suction valve or valves.

Second Stroke.—Compression along line 1–2. The final volume is known, since it is that of the clearance space. The compression is accompanied by a generation of heat and the final pressure can be calculated when the disposition of this heat is known. The usual preliminary assumption is that the heat remains in the air and the curve 1–2 is then called the adiabatic.

At the point 2 the explosion or ignition of the mixture takes place, in consequence of which the pressure suddenly rises from 2 to 3. This pressure can also be calculated for a given mixture. While it is true that the gases resulting from the combination brought about by ignition are different from those originally enclosed within the clearance space, their volume at the same temperature and pressure would, if anything, be a little less. The increase of pressure therefore is due entirely to the heating of the gases. The amount of heat furnished by the combination of the mixed gases determine the pressure at 3. The fact that the pressure thus determined differs very materially from that which actually obtains in the gas engine, has a very important bearing on its economy and has given rise to much speculation and investigation. All are agreed that the deficiency in pressure in the actual gas engine is due to the fact that the combination is not completed instantaneously but continues during the next stroke of the piston. The reason for this "Nachbrennen," as the German writers call it, is a point on which authorities do not agree.

Third Stroke.—Expansion of the heated gases from 3 to 4. This curve usually approximates the adiabatic, but is liable to differ from it very much on account of the continued combustion above referred to. At the point 4 the exhaust valve is opened and the pressure falls immediately to 1, namely, atmospheric pressure.

Fourth Stroke.—One to 5 driving out the products of combustion through the open exhaust valve. At 5 the exhaust valve is closed, leaving a volume of burned products in the cylinder represented by $5, 5^1$.

The cycle is now complete and the cylinder ready to draw in a fresh supply of the explosive mixture, compress and explode it and reject the burned products. It will be seen that the suction and exhaust valves are each open during one stroke out of four; they cannot therefore be actuated directly from the crank-shaft, for any motion derived from it will be repeated every revolution, that is, every two strokes. A number of solutions will be mentioned below, the simplest being the introduction of a lay-shaft driven at half the speed of the crank-shaft. Every motion derived from this lay-shaft will be repeated every four strokes or two revolutions. The required movement of the valve, namely, quick opening and closing, with an interval of rest between the two, is best effected by means of a cam.

In designing this cam care must be taken not to impart too violent a motion to the transmission parts, or a destructive hammering will result. The surface should be ground with an emery wheel of the same diameter as the roller and swinging on an arm of the same length as the lever carrying it. The dummy should be laid out so that the velocity of the valve and lever become zero at the seating of the valve, and at its highest lift the acceleration changing sign of course between the two extreme positions of the valve.

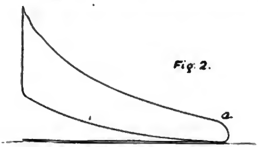


Fig. 2.

If these conditions be observed, the movement will be smooth and none of the work will be expended in jarring the moving parts. The diagram obtained from the cylinder of a gas engine differs, of course, from the ideal diagram of Fig. 1. Fig. 2 is a tracing of an actual diagram. The suction line is a little below the atmospheric and the exhaust line a little above the same. The degree to which this is observable measures the choking of the valve passages or pipes leading to them. The rounding of the curve at 4 indicates the gradual opening of the exhaust valve, commencing at the point marked *a*. The slide valve need not be considered as it has practically been superseded by the poppet valve.

When a rotating valve is used it can be operated by gearing it to the crank-shaft by means of a chain passing over sprocket wheels having a ratio two to one. The two to one motion of the lay-shaft may be obtained by spur gear as in some vertical engines by bevel gear, or by a combination of both as shown in Fig. 3. The most used mechanism is the spiral gear shown in Fig. 4. Whatever form of gearing is used it should be marked so that the lay-shaft can be removed and replaced without disturbing the position of the cams in relation to the crank-shaft.

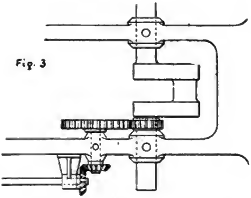


Fig. 3

A great many ingenious devices have been designed for the purpose of avoiding the gearing and the lay-shaft. It may be observed that the suction valve may be automatic, so that only the exhaust valve is necessarily operated by mechanism. One of the simplest of these is shown in Figs. 5 and 6. A rod operated by an eccentric on the crank-shaft actuates a ratchet-wheel, in which a high tooth alternates with a low tooth. When the rod falls into a low tooth it is in line with the exhaust valve and pushes it from its seat (Fig. 6). On the next revolution of the engine the rod rides on a high tooth and passes over the valve stem (Fig. 5). This is Robinson's arrangement.—*From Machinery*, New York.

(*To be continued.*)

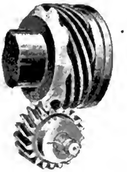


FIG. 4.

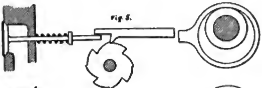


Fig 5.

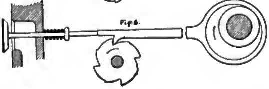


Fig 6.

Recent Patents on Gas Engines, Motors, Etc.

567,150. *Roller Bearing;* James D. Mattison, Saginaw, Mich. Filed Jan. 23, 1896. Serial No. 576,570.

567,253. *Vaporizer and Mixer for Gasolene Engines*; Jesse Pratt, Monroria, Cal., assignor of one-half to George L. Clark, Los Angeles, Cal. Filed Feb. 25, 1895. Serial No. 539,623.

567,260. *Speed Measure for Vehicles;* Horace J. Boon, Calumet, Mich. Filed Aug. 21, 1895. Serial No. 559,976.

567,309. *Ball Bearing;* Andrew C. Farnsworth, Chicago, Ill., assignor to E. C. Ritsher, same place. Filed Feb. 4, 1896. Serial No. 577,973.

567,432. *Gas Engine;* Harry A. Winter, Grand Rapids, Mich., assignor to the Sintz Gas Engine Co., same place. Filed June 24, 1895. Serial No. 553,897.

567,445. *Motor Vehicle;* Charles H. Barrows, Willimantic, Conn. Filed Jan. 17, 1896. Serial No. 575,905.

567,451. *Roller Bearing for Axles of Vehicles;* James Bradley, Niverville, N. Y., assignor to Anna Bradley, same place. Filed Nov. 20, 1895. Serial No. 569,482.

567,530. *Explosive Engine;* George H. Willetts, Zelienople, Pa. Filed Nov. 30, 1895. Serial No. 570,619.

567,629 and 567,630. *Spring Motor for Bicycles;* Carl Young, Chicago, Ill. Filed Oct. 28, 1805. Serial Nos. 567,148 and 567,149.

568,353. *Air Motor;* Walter H. Knight, New Brighton, N. Y. Filed Dec. 30, 1895. Serial No. 573,824.

568,431. *Motor-Propelled Vehicle;* Charles Delahunt, Olathe, Kan. Filed March 16, 1896.

567,954. *Gas Engine;* Con. D Anderson, Springfield, O. Filed April 1, 1895. Serial No. 543,930.

568,017. *Oil and Gas-Motor Engine;* John S. Cundall, Robert D. Cundall, William D. Cundall and Henry C. Cundall, Shipley, England. Filed April 25, 1896. Serial No. 589,120.

568,115. *Gas Engine;* John S. Klein, Oil City, Pa. Filed Jan. 4, 1896. Serial No. 574,360.

568,154. *Motor Attachment for Bicycles;* Isaac H. Davis, Boston, Mass. Filed June 11, 1896. Serial No. 595,086.

Join the
American Motor League.

Minor Mention.

Dutton Madden, Mechanicsburg, Pa., believes he has invented a perfect system of running the wheels of motor wagons, and wishes to correspond with manufacturers of motors.

The Mattison Roller Bearing Hub Co., Saginaw, E. S., Mich., are making preparations to supply the carriage trade with their new roller bearing hubs, which, it is claimed, require no oil or readjustment. C. A. Whittier, 646 Sixth Avenue, is the New York representative.

Messrs. Barrett and Perret have frequently been seen during the past two weeks guiding their new electric carriage about the streets of Brooklyn. The vehicle, which was built by J. Curley, of Brooklyn, is decidedly handsome in appearance, but the inventors are too conservative as yet to divulge the electrical and mechanical features.

The Daimler Motor Company have a very interesting exhibit at the American Institute Fair, now being held at Madison Square Garden. The exhibit comprises a Peugeot carriage propelled by a Daimler motor, a stationary kerosene motor, a launch and a railway inspection car, to which a Daimler motor has been attached.

A new motor, called the New York Motor, is to be seen at 11 Murray Street, New York. It runs on either gas or gasolene, is said to weigh about 100 pounds, and makes 300 revolutions a minute. A company, called the New York Motor Company, has been organized to manufacture this motor.

BOOK DEPARTMENT.

The following valuable books on gas engines and kindred subjects will be sent to any address in the United States or Canada on receipt of the published price. For foreign countries in the postal union extra postage will be charged as specified in each case.

A Practical Handbook on the Care and Management of Gas Engines. By G. Lieckfeld, C. E. Translated by George Richmond, M. E. With instructions for running oil engines. Just issued, and having an extensive sale.

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Elementary Treatise on the Gas Engine.—By Prof. Atkinson, of the School of Technology, Glasgow, Scotland.

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Advertisements inserted under this heading at $2.00 an inch for each issue, payable in advance.

WANTED.—**The Horseless Age.**—Numbers 1, 2 and 3 of THE HORSELESS AGE (November and December, 1895, and January, 1896,) will be exchanged for later or current numbers at the sender's option. THE HORSELESS AGE, 216 William Street, N. Y.

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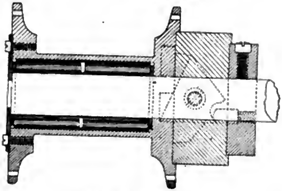

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Join The American Motor League.

________________189

American Motor League,
335 Dearborn Street, Chicago.

I hereby make application for membership in **The American Motor League**, and I agree to comply with the Constitution. By-Laws and Rules. I enclose Two Dollars for initiation fee and One Dollar for annual dues.

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Cut this out and send it to the Secretary, Dr. J. Allen Hornsby, 335 Dearborn Street, Chicago, Ill.

THE HORSELESS AGE.

A MONTHLY JOURNAL

DEVOTED TO MOTOR INTERESTS.

VOL. I. NEW YORK, OCTOBER, 1896. No. 12.

THE HORSELESS AGE.

E. P. INGERSOLL, Editor.

PUBLICATION OFFICE:

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ADVERTISEMENTS.—Rates will be made known on application. When change of copy is desired it should be sent in not later than the fifteenth of the month.

COMMUNICATIONS.—The Editor will be pleased to receive communications on trade topics from any authentic source. The correspondent's name should in all cases be given as an evidence of good faith, but will not be published if specially requested.

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Retrospect.

With this issue we close our first year of publication. In the United States it has been a year of financial stringency and political uncertainty, when all lines of trade have suffered, and when it is not strange that an embryonic industry should have languished for lack of the capital necessary for its development. Money for the organization of companies has not been obtainable, and many inventors have been compelled to suspend experiments through want of funds.

But in spite of the difficulties that have arisen in the path of motor pioneers, real progress can be recorded. Much that was visionary and impractical has been weeded out, and valuable data have been gathered by experimenters to be used in future work. If the effect of the competitions or races held up to the present time in this country was scarcely what might have been wished, they have not been without their lessons for the inventor and promoter, while the public has shown by the interest it has manifested in them that once introduced, the new vehicle will find the way to popularity a smooth and easy one.

As is usual in pioneer movements of all kinds, some who a year ago took up the investigation full of hope and confidence, have become discouraged and abandoned the work. Success is not so easily earned as we are prone to imagine, nor are the problems connected with the motor carriage to be solved by a hasty inspiration. The subject is a deep one, which grows as we penetrate further into it.

Though development has been slow in this country, in France, Belgium and England great strides have been made the past year, both mechanically and commercially. Many new companies, some with very large capital, have been floated, and in England particularly a most energetic propaganda has been carried on. The old Locomotive on Highways Act has been repealed, and everything there is in readiness for the practical introduction of the motor vehicle the moment the new law goes into effect on the 14th of November.

In the three countries above mentioned powerful organizations, headed by men of wealth and influence, have been formed for the promotion of the new industry. Exhibitions, races and festivals have been undertaken with the most gratifying success. In France manufacturers are increasing facilities to supply orders already written far ahead. Hence we may confidently look forward to a phenomenal growth of the industry in Europe the coming year, As for the domestic field, it is already ploughed and sowed, and with more favorable financial conditions will surely ripen and prove abundantly fruitful. Companies will now rapidly spring up all over the land, and motor vehicles will multiply in our streets.

Thanks partly to THE HORSELESS AGE, interest in the motor vehicle is well nigh world wide.

Wherever the spirit of progress prevails there will be found an interest in the new locomotion. In some of the torrid climes, where draft beasts die in harness under the cruel sun, the need of motor vehicles is keenly felt, and they will be adopted immediately upon the production of vehicles suited to the purpose. Such countries are India, Burmah, Australia, Southern Africa, Mexico, Central and South America—in fact, wherever work is now laboriously and expensively done with the horse or bullock, or left undone because these animals are unequal to the burden. Interest is also found in extreme northern latitudes, like Newfoundland and Norway.

With so wide and promising a field to exploit, nothing can longer prevent an immediate influx of capital and brains into the new industry.

* * *

Paris-Marseilles-Paris.

The third motor vehicle race in France seems to have been even more successful than those which preceded it. From it a great stimulus has been given to the industry throughout the whole of Europe. All the manufacturers who won prizes report an immediate increase of orders, notwithstanding that among the leading makers the terms of sale are extremely strict.

Over about half of the course the weather was execrable, a possibility which was foreseen when the contest was postponed to so late a date. Consequently some of the knowledge gained by the contestants was of the most rudimentary kind and not at all peculiar to the motor vehicle. That fallen trees and washouts are formidable obstacles to road vehicles has long been known, and to risk one's neck, not to speak of one's vehicle, in such a cyclone is more creditable to one's enthusiasm than to one's judgment. It required no prophet to see that a race under such conditions must prove disastrous to many of the participants; that no one was killed or maimed for life is matter for congratulation. Men engaged in a contest of this kind, as a rule, have neither the time nor the disposition to study caution. They are intent only upon the goal, and to those who did debate the question of postponement on the morning of the second day, it probably seemed better to finish the great race in the face of difficulties and dangers than to dampen the ardor of the people by a postponement. It is a trait of human nature to dislike to turn back once having set forth, and so the programme was carried out, and the motor vehicle again scored a victory.

So far as the mechanical lessons of the course are concerned there appear to be none new to the well-informed American student. The hot tube ignition long since revealed its disadvantages for road motors. It seems impossible to so confine the flame that it will not be frequently extinguished when a high wind is blowing. Delays due to the extinction of the tubes were a common occurence, and it is likely that the electric ignition will grow in favor in France from this time forth.

As to the respective merits of vertical and horizontal motors nothing conclusive can be drawn from this contest, both types having given a good account of themselves.

If the reports are correct the tire question is a vexed one with the French builders. It is said that the pneumatics were punctured more often than one could wish, and that the solid tires were badly cut up at the end of the journey. The proporportion of pneumatics among the entries was small, most of the French makers preferring the solid tire. The tricycles were fitted with pneumatics, but many of the punctures sustained by these, so the riders say, were traceable to the tack fiend, who had prepared the way for their coming. Whether the American tire is better than the French we cannot say. We have had no such severe test on this side of the water, and the French carriages are somewhat heavier than ours. Judging from American experience, however, a properly constructed tire, either solid or pneumatic, ought to give good service on the excellent roads of France.

Perhaps the most valuable discovery made during the race was the hostile attitude of the dog and the cow toward the new vehicle. All along the route these ordinarily inoffensive domestic animals became seized with a frenzy on seeing the rapidly approaching vehicles and rushed pell mell upon them. Many dogs were run over and killed, and three or four carriages were wrecked by encounters with one or the other of these animals. Thus a new opposition develops from a most unexpected quarter, an opposition which motor vehicle drivers must take into account or land ingloriously in the ditch. As a precaution it might be wise for tourists, on starting out for a long run, to provide themselves with a bushel of carrots with which to placate the bovine enemy, and a mess of bones to fling to Towser and so appease his wrath.

French manufacturers should make provision for these necessary supplies in their future models.

◆

Are More Races Needed?

There appears to be a difference of opinion among the French experts as to the desirability of holding further races. Some, though admitting the great benefit the industry has derived from the three already run, deprecate any more contests on the ground that speed would again be raised a notch and the danger greatly increased. Serious or fatal accidents would be almost sure to follow, and then the authorities would feel compelled to step in and restrict the speed of motor vehicles. Besides, they contend, the new vehicle is already thoroughly advertised and fast coming into general use, so that no more advertising of this kind is needed.

Others, and among them the Count de Dion, still see value in the race. Aside from the advertising feature, which they believe is far from exhausted, they regard the race as almost indispensable to the manufacturer at the present stage of the industry, because it reveals to him weaknesses of construction which would not otherwise come to light so soon.

There is truth in both of these contentions. Road contests give valuable lessons, but road contests must be carefully regulated or they will result in deplorable accidents. The chief engineer in charge of the Department of Roads and Bridges has already taken alarm at the reckless speed attained in some parts of the course, and is thinking seriously of establishing a speed limit for motor vehicles on common roads.

This is just what might have been expected, and what will undoubtedly be done in all countries where motor vehicles come into extensive use. Accidents are bound to occur when speed is forced beyond the limit of safety, and the authorities will be compelled to interfere.

A New Opening for Mechanics.

In France and England steps are being taken to educate a class of mechanics competent to handle and repair motor vehicles. The same need will very soon be felt here, and an opportunity is now afforded enterprising mechanics of qualifying themselves to take charge of a motor vehicle or to act as repairers in case of accident on the road. Bicycle repairers, blacksmiths, wheelwrights and general machine repairers can turn an honest dollar in this way, and in time many of them would find it profitable to devote their entire time to this branch of business.

A good way to qualify for such work is to read THE HORSELESS AGE regularly.

◆

Wind Resistance.

The effect of wind resistance on the progress of a road vehicle has not been sufficiently considered. As speed increases this factor becomes of greater importance. The high winds which prevailed over much of the Paris-Marseilles course gave the contestants a chance to see the difference between a favoring and an adverse wind, as was the case also at Providence, R. I., last month. On the first and second days the wind was high, but the third heat was run in a calm, and much faster time was made. It would have been impossible for the vehicles that competed there to have reached a speed of 26 miles an hour facing a strong gale.

◆

Some of the prices printed in our book department last month require revision. The new and enlarged edition of Donkyn's treatise, just issued, sells at $7.50 instead of $6.50, and owing to the unexpected growth of material, Mr. Hiscock has found it necessary to increase the size of his book and raise the price to $3.

◆

In the back of this issue will be found an alphabetical index to Volume I., extending from November, 1895, to October, 1896, inclusive. Hereafter the pages will be numbered consecutively for more ready reference.

◆

Volume 1, No. 1.

PARTIES having copies of the November, 1895, number of THE HORSELESS AGE, which they are willing to sell or exchange for later numbers, are requested to communicate with the publisher.

Paris—Marseilles—Paris.

FULL ACCOUNT OF THE GREAT 10-DAY ROAD RACE OF 1,051 MILES.

The great road race for motor vehicles from Paris to Marseilles and return (1,051 miles) has been run and won by the Daimler motors, as it was last year, when over the course from Paris to Bordeaux and return, Panhard & Levassor and Peugeot Frères came in for the chief prizes.

The course of 1896 differed in many respects from that of 1895. It was over 300 miles longer, and the continuous runs day and night which had proved so exhausting to the operators last year were abolished and the course divided into 10 stages, five out and five in. Thus the contestants could obtain rest nightly, and the conditions approached more nearly to those a motor carriage might encounter in general touring.

The five stopping places were Auxerre, Dijon, Lyon, Avignon and Marseilles, and in each of these a storage place called a "parc" was secured for the accommodation of the vehicles over night. "Controles" were also established along the route at stated intervals, as they were last year, so that the time of each vehicle could be taken officially as it passed.

Of the 45 entries only 32 appeared on the 12th of September, when the vehicles were assembled in the Place de l'Etoilé and sent on to Versailles, where the real start was to be made.

Three classes of vehicles competed for the prizes—those of two or four places, those of more than four and motorcycles or light vehicles of the tricycle order, which in the preliminary run from Paris to Mantes and return had proved themselves worthy to attempt the great race.

A vast throng of the curious and the interested filled the Place de l'Etoilé, as the vehicles lined up for the start. Here were the prominent members of the Automobile Club, journalists, cyclists, engineers, inventors, society lions in motor carriages, and the usual motley crowd that collects at any novel sight in Paris as well as in other large cities. Quite a delegation from the Motor Car Club, of London, was in evidence. Major Tullock attended as the representative of the British Government, and Sir David Salomons, of motor fame, was also among the distinguished guests, to whom Baron Zuylen de Nyevelt tendered a complimentary banquet the evening preceding the race.

All the contestants and those in charge of the controles had received neat little pamphlets of 116 pages giving all the rules and details of the course, and bearing on the cover the imprint of the Automobile Club.

The machines arrived before the appointed hour of 11 o'clock and were ranged in order on the Place d'Armes by the Comte de la Valette, master of ceremonies of the Automobile Club.

The 31 vehicles that started, the order of their starting and the numbers they bore are as follows:

33. Fisson.
41. Delahaye.
29. Maison Paris Voitures Automobiles.
30. Maison Paris Voitures Automobiles.
5. Panhard & Levassor.
6. Panhard & Levassor.
44. Peugeot & Co.
42. Delahaye.
12. De Dion & Bouton.
20. Bollée.
8. Panhard & Levassor.
9. Lebrun.
26. Landry & Beyroux.
45. Peugeot & Co.
28. Rossel.
46. Peugeot & Co.
7. Panhard & Levassor.
24. Triouleyre.
25. Triouleyre.
10. De Dion & Bouton.
39. Michelin.
21. Bollée.
47. Bollée.
52. De Dion (tricycle).
15. De Dion (tricycle).
51. De Dion (tricycle).
13. De Dion (tricycle).
14. De Dion (tricycle).
43. Société Rochet-Schneider.
23. Michelin.
37. Tissandier.

Of these all were petroleum vehicles, with the exception of Nos. 10 and 12, of De Dion and Bouton, which were propelled by steam. No electric carriages competed

The description of the vehicles is appended:

No. 33.—Phaeton of four places, conducted by M. Fisson, and carrying two more persons.

No. 41—Break of four places, conducted by M. Archdeacon, and carrying three more persons.

No. 29.—Phaeton of four places, conducted by M. Radloer, and carrying three more persons.

No. 30.—Vis-a-vis, conducted by M. Labouret, and carrying three more persons.

No. 6.—Phaeton of four places, conducted by M. Mazade, and carrying three more places.

No. 44.—One seated vehicle, carrying two persons.

No. 5.—Duc with one seat, conducted by M. Levassor, and carrying one mechanic.

No. 42.—Dog-cart, conducted by M. Delahaye, and carrying three more persons.

No. 12.—Steam wagon conducted by the Count de Dion, and carrying three more persons.

No. 20.—*Vis-a-vis* of four places, conducted by A. Bollée, and carrying three more persons.

No 8.—Break of four places, conducted by M. Réne de Knyff.

No. 9.—Duc, conducted by M. le Brun, and carrying one other person.

No. 26.—Cabriolet for two, conducted by M. Landry, and carrying one passenger.

No. 45.—Duc for two, conducted by two skilled mechanics from the Peugeot factories.

No. 28.—Duc for two, conducted by M. Ressel, and carrying one passenger.

No. 46.—Break carrying four persons.

No. 7.—Vehicle seating six persons, conducted by M. Du Bois.

No. 24.—Wagonette for six, conducted by M. Valentin.

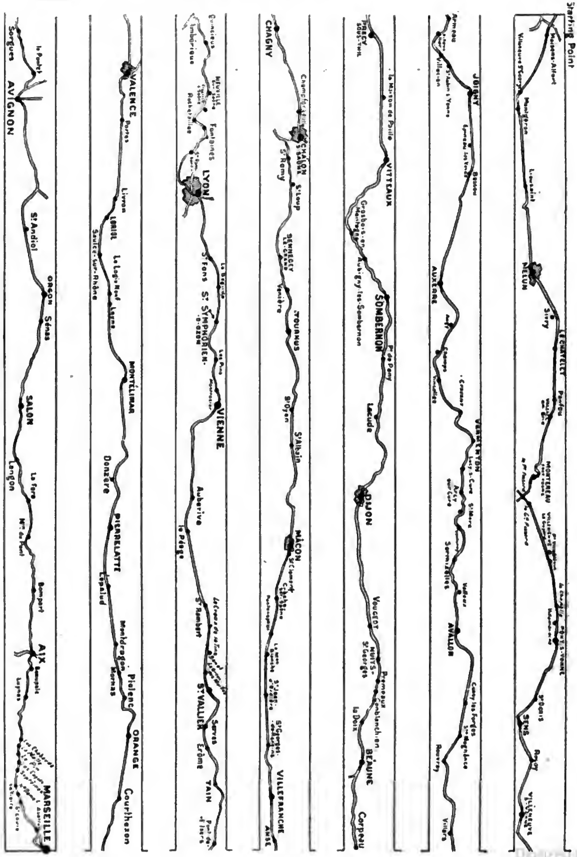
No. 25.—Duc for two, conducted by M. Estelle.

No. 10.—Steam break for six, conducted by MM. the Marquise and the Count de Chasseloup Laubat, and carrying three mechanics.

No. 39.—Voiturette of the Bollée type, made by Michelin, carrying two.

No. 21.—Voiturette Bollée conducted by Camille Bollée, and carrying another.

No. 47.—Voiturette Bollée, conducted by Leon Bollée, and carrying one passenger.



ROUTE OF THE PARIS–MARSEILLES–PARIS RACE.

No. 51.—De Dion tricycle, conducted by M. Chevalin, winner of the Paris-Mantes race.

No. 15.—De Dion tricycle, conducted by M. Delieuvin, also a prize winner in the Paris-Mantes event.

No. 52.—De Dion tricycle, conducted by M. Collomb.

No. 13.—De Dion tricycle, conducted by M. Viet.

No. 14.—De Dion tricycle, conducted by M. Boiron.

No. 43.—Vis-a-vis, for four, conducted by M. Rochet.

No. 23.—Tandem Bollée voiturette (Michelin).

No. 37.—Vis-a-vis for two, conducted by M. Tissandier and carrying one passenger.

No. 38.—Vis-a-vis for four, conducted by M. Tenting.

It will be seen that in the majority of instances manufacturers took charge of their own vehicles and were accompanied by trusted employees or friends who were experienced in the motor line.

ONE OF COUNT DE DION'S STEAM WAGONS.

A great deal of interest centred around the new Bollée carriage, No. 20, which reached Paris only a few hours before the race. In this vehicle the body is separated entirely from the motor and machinery. The motor, developing six horsepower, is a two-cylinder horizontal engine and leather belting is employed in transmission. The hot tube is used in firing.

A slight accident marred the exhibition in the Place d'Armes. The crowd gathered so closely around the vehicles that when the word was given M. Fisson to start, one sight-seer who was not agile enough to get out of the way was struck and knocked down by the wheel. His injuries were found to be slight, but M. Fisson and several who followed him were called back for a new start. Hundreds of cyclists and students of the automobile followed the carriages to Versailles, some on bicycles, others in motor carriages and others in horse conveyances.

From Versailles the vehicles were despatched at intervals of one minute. After all had been sent off the Baron Zuylen de Nyevelt, president of the Automobile Club, invited a number of the club's guests to accompany him on a special train, which he had chartered for the purpose of following the race.

Between Versailles and Auxerre there were three "flying controles," or places where official time was taken on the wing. These places were Melim, Petit-Fossard and Sens.

Before Auxerre was reached several mishaps occurred. No. 5, of Panhard & Levassor, lost one of its solid tires, causing a delay of one hour and a half; No. 6, of the same firm, was delayed two hours by an accident to the shaft; the steam brake of the Count de Dion, No. 10, was brought to a standstill by a hot box and did not reach Auxerre until half past eight the next morning; No. 12 also, a heavy De Dion steam wagon, crushed its pneumatics on the way and was obliged to withdraw; No. 45, a Peugeot carriage, was troubled with a creeping tire.

The entrance into Auxerre was attended by a great public demonstration; in fact, the people all along the route showed the liveliest interest, peasants bringing their luncheon and sitting by the roadside to see the carriages pass.

The official time of each vehicle for the first stage is as follows:

FIRST STAGE, 107 MILES.

Number.	Name.	Time of leaving Versailles.		Time of arrival at Auxerre.			Time of journey.		
		h.	m.	h.	m.	s.	h.	m.	s.
33	Fisson	11	7	—	—	—	—	—	—
41	Delahaye	11	8	5	43	8	6	35	8
29	Maison Parisienne (Bentz & Co)	11	9	9	—	10	9	51	10
30	"	11	10	8	19	14	9	9	14
6	Panhard & Levassor	11	11	9	17	35	10	6	35
44	Peugeot	11	12	6	55	53	7	43	53
5	Panhard & Levassor	11	13	6	11	23	6	58	23
42	Delahaye	11	14	6	25	26	7	11	26
12	De Dion-Bouton	11	15	—	—	—	—	—	—
20	A. Bollée	11	16	6	26	23	7	10	23
8	Panhard & Levassor	11	17	6	9	25	6	52	25
9	Lebrun	11	18	9	52	20	10	34	20
26	Landry & Beyroux	11	19	6	33	1	7	14	1
45	Peugeot	11	20	8	26	44	8	6	44
28	Rossel	11	21	7	46	35	8	25	35
46	Peugeot	11	22	7	51	22	8	29	22
7	Panhard & Levassor	11	23	6	18	28	6	55	28
24	Triouleyre	11	24	10	34	31	11	10	31
25	"	11	25	—	—	—	—	—	—
10	De Dion-Bouton	11	26	—	—	—	—	—	—
39	Voiturette Bollée (Michelin)	11	27	11	17	49	11	50	49
21	Bollée	11	28	5	53	41	6	25	41
47	"	11	29	5	3	3	5	34	3
52	Tricycle de Dion	11	30	7	1	30	7	31	30
15	"	11	31	6	31	36	7	—	36
51	"	11	32	5	29	4	5	57	4
13	"	11	33	6	31	34	6	58	34
14	"	11	34	7	59	54	8	25	54
43	Rochet-Schneider	11	35	7	52	30	8	17	30
23	Voiturette Bollée	11	36	11	56	12	12	20	12
37	Tissandier	11	37	8	6	43	8	29	43

It will be seen that the quickest trip was made by the motorcycles of De Dion and Bollée, No. 47 of the latter accomplishing the distance at an average speed of nearly 20 miles an hour.

As fast as they arrived the vehicles were put up for the night in the park, where the curious public examined them from a distance.

The conductors and passengers, and those who were following the race, retired early to be on hand for the start, which occurred from the outgoing controle at 7 o'clock the next morning, No. 47, the Bollée voiturette, which made the best time from Marseilles, taking the lead.

PARIS-MARSEILLES-PARIS RACE. THE START FROM THE PLACE DE L'ETOILE.

Rain, accompanied by a terrific wind, intervened, and caused much discomfort to the racers, but this was nothing as compared with the fury of the elements which they were to experience later on this stage of the course through the Rhone valley.

The same rule of sending the vehicles off at intervals of one minute was observed here, the last to receive the word being another Bollée voiturette, No. 23, which was the last to arrive at Auxerre.

ONE OF THE TRIOULEYRÉ CARRIAGES

Again the members of the Automobile Club and their guests took the special train to proceed to Dijon.

The rain increased in violence as the contestants proceeded toward Dijon, and the wind rose to the force of a hurricane, frequently blowing the carriages to one side of the road.

Despatches were continually sent from the flying controles announcing the passage of the vehicles to the Paris press, and to the officers of the Automobile Club.

NEW CARRIAGE OF AMÉDEE BOLLÉE.

Between Auxerre and Dijon there were also three controles—at Cravaut, Avallon and Vitteaux. As the news arrived from these controles it was plain to be seen that the terrible storm was playing sad havoc with the automobiles.

The Bollée vehicle, No. 20, of which so much was expected, ran into a tree in the road and was disabled. In fact the tribulations of the three brothers Bollée, Amédeé, Leon and Camille, are pitiable to relate. Leon, who was conducting No. 47, and made such a splendid record the first day, began to have trouble with his machine soon after leaving Auxerre, and finally came to a standstill. An examination revealed such a state of things in the carburetors that M. Bollée was forced to the conclusion that some enemy had put powdered emery in them to grind them out. In fact he states positively, and is borne out in it, that traces of powdered emery were discovered. A little further on M. Leon encountered No. 20, another vehicle of his make, guided by his brother Amédeé, badly used up by collision with a tree blown across the road by the tempest. His brother had disappeared. Full of solicitude for his brother, he searched for him and finally found him seriously injured.

Camille, who conducted No. 21, and had stopped to repair a twisted axle, meantime learned of the accident which had befallen No. 20, and leaving his vehicle, set out to find the injured brother. Fortunately M. Amédeé's hurts were not so serious as feared, but as a result of their delay and exposure to the elements the three brothers concluded that it was useless to try to proceed and shipped their vehicles back to Paris. For the Bollées the second stage was indeed a series of misfortunes, against which it was useless to contend.

Of the other voiturettes only one, No. 39, succeeded in getting through to Dijon.

No. 8, of Panhard & Levassor, lost its top in the wind.

No. 42 was delayed several hours by the trees and branches scattered in the road.

Nos. 44 and 46 found some parts impassable on this stage and made long detours before they could regain the route.

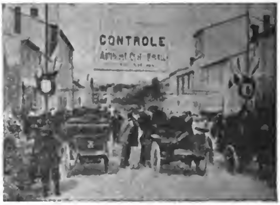
No. 28 escaped from the control of its operators, who were pushing it up a hill and lost control of it at the top, and was dashed into a tree in the descent.

At Dijon Panhard & Levassor were in the lead, No. 5 being first, No. 8 second, and No. 7 third.

The official time for the second stage is as follows:

SECOND STAGE, 90 MILES.

Number.	Name.	Time of leaving Auxerre.		Time of arrival at Dijon.			Time of Journey.		
		h.	m.	h.	m.	s.	h.	m.	s.
47	Voiturette Bollée	7	8	—	—	—	—	—	—
51	Tricycle de Dion	7	9	6	11	—	11	2	—
41	Delahaye	7	10	4	54	50	9	44	50
8	Panhard & Levassor	7	11	3	35	—	8	24	—
5	" "	7	12	2	3	40	6	51	40
7	" "	7	13	3	37	—	8	24	—
42	Delahaye	7	14	1	28^1	—	18	14	—
30	Maison Parisienne (Bentz Co.)	7	15	5	38	—	10	23	—
26	Landry & Beyroux	7	16	7	15	10	11	59	10
46	Peugeot	7	17	4	42	15	9	25	15
21	Voiturette Bollée	7	18	—	—	—	—	—	—
9	Lebrun	7	19	7	17	—	11	58	—
29	Maison Parisienne (Bentz Co.)	7	20	6	50	15	11	30	15
13	Tricycle de Dion	7	21	4	18	50	8	57	50
15	" "	7	22	8	55	30	13	33	30
44	Peugeot	7	23	3	57	20	8	34	20
37	Tissandier	7	24	—	—	—	—	—	—
45	Peugeot	7	25	—	—	—	—	—	—
14	Tricycle de Dion	7	26	—	—	—	—	—	—
6	Panhard & Levassor	7	27	2	8	30	6	41	30
24	Triouleyre	7	28	—	—	—	—	—	—
39	Voiturette Bollée	7	29	11	17	49	15	48	49
20	A. Bollée	7	30	—	—	—	—	—	—
52	Tricycle de Dion	7	31	—	—	—	—	—	—
28	Rossel	7	32	—	—	—	—	—	—
43	Rochet & Schneider	7	33	3	58	25	8	25	25



PARIS-MARSEILLES-PARIS RACE.

—

VIEWS OF CONTROLES AND PARKS ON THE ROUTE.

The morning of the third day the rain still fell in torrents, though the wind had somewhat abated. At about half past seven the racers were sent off on their way to Lyons, the Panhard & Levassor carriages taking the lead.

The three controles of the third stage were not passed without accident, but owing to the abatement of the storm, better time was made.

No. 7, of Panhard & Levassor, while avoiding a loaded wagon which it encountered in the road, ran into the sidewalk and was overturned, injuring one of the passengers so seriously that he had to be taken back to Paris by train.

No. 43 ran into a cow and got the worst of the encounter, n consequence of which it was unable to proceed.

The table for the third stage is appended :

THIRD STAGE.—118 MILES.

Number.	Name.	Time of leaving Dijon.	Time of arrival at Lyon.	Time of journey.
		h. m.	h. m. s.	h. m. s.
5	Panhard & Levassor	7 32	2 33 8	7 18 —
6	" "	7 33	2 2 29	6 29 29
8	" "	7 34	2 58 2	7 24 2
7	" "	7 35	— — —	— — —
44	Peugeot	7 36	2 40 12	7 4 12
43	Rochet-Schneider	7 37	— — —	— — —
29	M. Parisienne	7 38	8 14 40	12 36 40
13	Tricycle de Dion	7 39	2 55 20	7 16 20
30	M. Parisienne	7 40	5 36 16	9 55 16
46	Peugeot	7 41	2 40 35	6 59 35
9	Lebrun	7 42	9 10 30	13 28 30
51	Tricycle de Dion	7 44	3 45 15	8 1 15
41	Delahaye	7 45	4 22 14	8 37 14
26	Landry & Beyroux	7 46	9 20 40	13 24 30
15	Tricycle de Dion	7 47	4 28 40	8 41 30
42	Delahaye	7 48	5 6 —	9 18 —

The fourth stage, from Lyon to Avignon, which also included three controles, was marked by several accidents, only one being of a serious nature.

No. 26 was delayed by a hot box.

No. 5, conducted by M. Levassor, winner of the Paris-Bordeaux race, ran over a big dog and upset, throwing M. Levassor against a tree, and bruising and shaking him up considerably.

After recovering from the shock, M. Levassor and comrade resumed the journey as best they could with a broken spring, until a blacksmith shop was reached, where the damage was repaired.

At half-past nine in the evening No. 5 reached the park at Avignon, and M. Levassor had his injuries examined by a physician. Fortunately they were not serious, although the conduct of the vehicle was given into the hands of his companion for the rest of the way.

No. 9 also met with an accident. One of its solid tires came loose and caught in the machinery, necessitating a delay of 24 hours.

The table of the fourth stage, somewhat longer than those previous, is as follows :

FOURTH STAGE—135 MILES.

Number.	Name.	Time of leaving Lyon.	Time of arrival at Arignon.	Time of journey.
		h. m.	h. m. s.	h. m. s.
6	Panhard & Levassor	7 22	5 12 2	9 50 2
5	Id.	7 23	9 34 6	14 11 6
44	Peugeot	7 24	4 23 —	8 59 —
46	Id.	7 25	3 13 43	7 48 43
13	Tricycle de Dion	7 26	3 22 44	7 56 44
8	Panhard & Levassor	7 27	3 46 28	8 19 28
51	Tricycle de Dion	7 28	3 27 30	7 59 30
41	Delahaye	7 29	3 39 30	8 10 30
42	Id	7 30	4 15 18	8 45 18
30	M. Parisienne (Bentz)	7 31	8 9 6	12 38 6
29	Id.	7 32	7 55 33	12 23 33
9	Lebrun	7 33	— — —	— — —
26	Landry & Beyroux	7 34	5 15 30	9 41 30
15	Tricycle de Dion	7 36	5 4 —	9 28 —

Owing to the pleasant weather the crowd of sightseers increased in number as the contestants approached Marseilles. Thousands of enthusiastic spectators cheered the vehicles on their departure from Avignon for Marseilles, No 46, a Peugeot carriage, leading the way. With everything favorable and a short stage before them the carriages quickly covered the distance, all but three entering the city before noon. It is estimated that 100,000 people gathered in the street and parks of the Mediterranean city to do honor to automobilism.

The official time between Avignon and Marseilles is as follows :

FIFTH STAGE.—60 MILES.

Number.	Name.	Time of leaving Avignon.	Time of arrival at Marseilles.	Time of journey.
		h. m.	h. m. s.	h. m. s.
46	Peugeot	7 37	11 4 12	3 27 13
13	Tricycle de Dion	7 38	10 56 18	3 18 18
51	"	7 39	11 1 31	3 22 31
41	Delahaye	7 40	11 31 41	3 51 40
8	Panhard & Levassor	7 41	11 21 43	3 40 43
42	Delahaye	7 42	11 36 30	4 4 30
44	Peugeot	7 43	10 58 30	3 15 30
15	Tricycle de Dion	7 44	11 30 18	3 39 18
6	Panhard & Levassor	7 45	10 51 13	3 6 13
26	Landry & Beyroux	7 46	midi 51 —	5 5 —
29	Maison Parisienne (Bentz)	7 47	12 42 —	5 37 —
30	"	7 48	1 32 —	6 4 —
5	Panhard & Levassor	7 50	11 8 40	3 19 40

During the night several other vehicles, which had met with accidents on the way, joined the others at Marseilles. The Panhard & Levassor carriage No. 7, which had been delayed 24 hours on the third stage, came in in the evening, and at 3 o'clock in the morning No. 39, a tandem voiturette, put in an appearance. No. 9 also reached Avignon before the return journey was commenced.

After holding an exhibition and a parade through the streets of the city the vehicles set out over the return course, 16 in number, instead of 13. Little worthy of mention occurred in the sixth stage, except that the tricycles began to show fine speed, keeping the Panhard & Levassor carriages at the top notch. The time for this stage is appended:

SIXTH STAGE—60 MILES.

Number.	Name.	Time of leaving Marseilles.	Time of arrival at Avignon.	Time of journey.
		h. m.	h. m. s.	h. m. s.
6	Panhard & Levassor	12 16	4 1 54	3 45 54
44	Peugeot	12 17	4 20 3	4 3 3
46	"	12 18	4 3 59	3 45 59
15	De Dion-Bonton	12 19	4 2 22	3 43 22
5	Panhard & Levassor	12 20	4 12 4	4 2 14
8	" "	12 21	4 7 29	3 46 29
41	Delahaye	12 22	5 3 30	4 41 30
29	Maison Parisienne	12 23	5 41 35	5 18 35
26	Landry & Beyroux	12 24	4 40 6	4 16 6
51	Michelin-de Dion	12 25	4 1 55	3 36 55
13	De Dion-Bouton	12 26	4 16 28	3 50 28
42	Delahaye	12 28	5 8 49	4 40 49
30	Maison Parisienne	12 29	6 56 30	6 27 30
39	Michelin-Bollée	12 31	5 50 17	5 19 17
9	Lebrun	12 32	9 47 20	10 19 20
7	Panhard & Levassor	12 33	10 45 45	11 18 45

During this and the succeeding stage the contestants were compelled to face the strong wind, which had favored them coming down. This not only directly impeded their progress but also filled their eyes full of dust, and added to the discomfort and danger of the journey.

At Avignon No. 7 withdrew from the race, the repairs not having proved permanent.

On the way to Lyons No. 26 lost a tire, causing a delay of many hours. No. 9 also found that temporary repairs are no lasting and arrived late at night.

The official figures are:

SEVENTH STAGE.—137 MILES.

Number	Name.	Time of Leaving Avignon.	Time of Arrival at Lyon.	Time of Journey.
		h. m.	h. m. s.	h. m. s.
6	Panhard & Levassor	7 9	3 30 10	8 21 10
15	De Dion-Bouton	7 10	5 40 35	10 30 35
46	Peugeot	7 11	4 14 45	9 3 45
51	Michelin-de Dion	7 12	8 1 —	12 49 —
8	Panhard & Levassor	7 13	5 3 50	9 50 50
5	"	7 14	3 59 32	8 45 32
13	De Dion-Bouton	7 15	6 39 6	11 24 6
44	Peugeot	7 16	5 20 20	10 4 20
26	Landry & Beyroux	7 17	11 40 —	28 23 —
41	Delabaye	7 18	6 41 15	11 23 15
42	"	7 19	4 45 22	9 26 22
29	Maison Parisienne	7 20	9 23 24	14 3 24
30	"	7 21	8 37 14	13 16 14
9	Lebrun	7 22	4 38 mat	21 21 —
39	Michelin-Bollée	7 24	6 2 3	10 38 3

The eighth stage, from Lyons to Dijon, was accomplished without any incident worth relating, with the exception of the detention of No. 26, which however was driven forward by night and reached Dijon.

The effect of the long strain was seen in the slower speeds attained on the return journey. The figures for the eighth stage are:

EIGHTH STAGE—118 MILES.

Number.	Name.	Time of leaving Lyons.	Time of arrival at Dijon.	Time of journey.
		h. m.	h. m. s.	h. m. s.
6	Panhard & Levassor	7 37	2 12 50	6 35 50
5	" "	7 38	3 42 58	8 14 58
46	Peugeot	7 39	3 49 25	8 10 25
42	Delahaye	7 40	3 21 55	7 41 55
8	Panhard & Levassor	7 41	2 44 25	7 3 25
44	Peugeot	7 42	9 10 2	13 28 2
15	Tricycle de Dion	7 43	4 26 45	8 43 45
39	Michelin-Bollée	7 44	4 42 52	8 58 52
13	Tricycle	7 45	3 35 55	7 50 55
41	Delahaye	7 46	4 9 10	8 23 10
51	Tricycle de Dion	7 47	3 42 35	7 55 35
30	Maison Parisienne	7 48	4 (1)	20 12 —
29	"	7 49	6 49 30	11 — 30
9	Panhard & Levassor	7 51	6 10m. (1)	22 19 —
26	Landry & Beyroux	7 52	12 35 (1)	28 43 —

MOTOR TROPHY OFFERED BY THE MOTOR CAR CLUB, OF LONDON.

The ninth stage, instead of being from Dijon to Auxerre, like the second, extended from Dijon to Sens, 35 miles more, and as it was distinguished by perils and accidents on the outward journey, the contestants had good cause to remember it.

At 8.21 No. 6 was sent on its way, followed by the other 13 in the order of their performance during the last stage.

On reaching the controle at Sens the conductor of No. 6 was presented with a magnificent bouquet.

No. 44 was proceeding finely up to the controle, when, within half a mile of it, the differential gear got out of order and caused a delay of over three hours.

No. 46 also met with a detention at Avallon, the pump having gotten out of order.

Notwithstanding their disabled condition, Nos. 26 and 9 persevered in the hope of reaching Paris without outside aid.

All now nerved themselves for the final stage from Sens to Paris, 90 miles. The weather was fine, and at 7.20 the word was given, No. 6 leading off, followed by Nos. 5 and 8, all Panhard & Levassor vehicles.

No. 9, the Lebrun carriage, dropped by the way, but No. 26 was in at the finish, witnessed by an enormous throng at the Boulevard Maillot.

One of the De Dion tricycles led the carriages in the last stage by dint of hard pedaling, and crossed the line three minutes ahead of the fleetest, No. 8, Panhard & Levassor amid the plaudits of the assemblage.

The performance of the De Dion tricycles, weighing only about 150 pounds, is regarded as most remarkable and the committee of the Automobile Club has decided to award to them a special gold medal.

The motors of Panhard & Levassor were of an improved Daimler pattern recently designed by this firm. Peugeot & Co., however, used a two-cylinder horizontal motor of their own manufacture, publicly tested for the first time in this race.

The route was quite hilly in some parts, particularly about Lyons and Avignon. The steepest gradient, however, did not exceed 10 per cent.

The contestants were greatly annoyed by dogs, which rushed out at the rapidly moving vehicles and in some instances were caught under the wheels and killed. It is said that no fewer than 14 canines were thus sacrificed to automobilism during the Paris-Marseilles race.

The antipathy of the dog for the new vehicle seems to be shared by the bull, for the Rochet-Schneider carriage was so badly damaged by an attack of one of these infuriated animals that M. Schneider was obliged to give up the contest. The Bollée vehicle was also disabled by disputing the way with a cow.

THE FINISH—THE DE DION TRICYCLE COMING UP THE BOULEVARD MAILLOT.

The official figures for the ninth and tenth stages are as follows:

NINTH STAGE, 125 MILES.

Number.	Name.	Time of leaving Dijon.	Time of arriving at Sens.	Time of journey.
		h. m.	h. m. s.	h. m. s.
6	Panhard & Levassor........	7 21	2 25 —	7 4 —
8	" "	7 22	3 12 3	7 50 3
42	Delahaye...	7 29	4 32 15	9 9 15
13	De Dion-Bouton............	7 24	3 52 39	8 28 39
51	Michelin-De Dion...........	7 25	3 15 48	7 50 48
5	Panhard & Levassor...	7 26	2 43 16	7 17 16
46	Peugeot.......	7 27	8 10 12	12 43 12
41	Delahaye	7 28	4 25 6	8 57 6
44	Peugeot................ . ..	7 29	8 12 15	12 43 15
29	Maison Parisienne (BentzCo).	7 30	8 20 5	12 50 5
30	"	7 31	8 — 35	12 29 35
39	Michelin-Bollée	7 32	3 23 46	7 51 46
15	De Dion-Bouton.......... .	7 33	6 50 30	11 17 30
9	Lebrun.....................	7 34	1 15 s. (1)	29 41 —
26	Landry & Beyroux....... .	7 35	4 4935(1)	27 14 35

TENTH STAGE, 90 miles.

Number.	Name.	Time of leaving Sens.	Time of arrival at Paris.	Time of journey.
		h. m.	h. m. s.	h. m. s.
6	Panhard & Lavassor.........	7 20	1 2 15	5 42 15
5	"	7 21	12 22 35	5 1 35
8	"	7 22	12 21 40	4 59 40
51	Michelin-de Dion	7 23	12 18 34	4 55 34
39	Michelin-Bollée.	7 24	12 30 1	5 6 1
13	De Dion-Bouton.............	7 25	12 24 6	4 59 6
41	Delahaye....................	7 26	12 31 20	5 5 20
30	Maison Parisienne.	7 27	3 30 5	8 3 5
46	Peugeot	7 28	1 — 55	5 32 55
44	"	7 29	12 57 16	5 28 16
29	Maison Parisienne...........	7 30	3 42 25	8 12 25
26	Landry & Beyroux..........	7 31	2 39 30	7 8 30
15	De Dion-Bouton...........	7 32	2 — 10	6 28 10
42	Delahaye...	7 33	1 38 30	6 5 30
9	Lebrun....................	— —	— — —	— — —

The carriages which were entered in the race were, generally speaking, the regular commercial models of the various manufacturers, and the same styles of carriages can be purchased by any customer who desires them.

M. Archdeacon, who conducted the Delahaye vehicle, which secured the fourth prize, states that on some of the long down grades he reached a speed of from 35 to 40 miles an hour.

The Count de Dion was as successful with his petroleum tricycles as he was unsuccessful with his steam wagons. He has proved to the satisfaction of Parisian amateurs that the electric ignition is reliable, and that a small gasolene motor may dispense with a water jacket and depend on radiating ribs for cooling.

The vehicles which completed the entire course, with the mean speed of each, are given in their order in the following table:

Order.	Number	Name.	Total Time of Journey.	Average Speed.
			h. m. s.	k. m.
1	6	Panhard & Levassor.	67 42 58	25 20
2	8	id.	68 11 5	24 60
3	13	De Dion & Bouton.	71 1 5	24 —
4	5	Panhard & Levassor.	71 23 22	23 94
5	51	Michelin.	73 30 12	23 22
6	46	Peugeot & Co.	75 26 24	22 68
7	41	Delahaye.	75 29 48	22 62
8	44	Peugeot & Co.	81 23 51	21 —
9	15	De Dion & Bouton.	83 13 16	20 40
10	42	Delahaye.	84 27 5	20 22
11	29	Maison Parisienne.	102 41 37	17 22
12	30	id.	108 39 —	15 74
13	26	Landry & Beyroux.	119 44 21	14 29
14	39	Michelin.	141 10 47	12 18

In the first class, and first series, for vehicles of two, three or four places, the first, second and third prizes were awarded to Panhard & Levassor; the fourth to Delahaye, whose carriage, No. 41, came through the ordeal almost unscathed, the fifth to Peugeot, the sixth to Delahaye and the seventh to the Maison Parisienne (Benz motor).

In the second series of class A, Peugeot received the first and only prize, No. 46 being the only vehicle of more than four places which came through.

BEST SPEED FOR EACH DAY.

(In Miles Per Hour.)

Speed.	Day.	Date.	Entry.		Final order.
			No.	Name.	
21.80	5th	28 Sept.	6	Panhard & Levassor.	1
20.10	1st	24 "	47	Bollée.	—
15.74	6th	29 "	51	De Dion & Bouton.	5
18.68	8th	1 Oct.	6	Panhard & Levassor.	1
18.38	9th	2 "	6	" "	1
18.11	4th	27 Sept.	46	Peugeot & Co.	6
18.00	3d	26 "	6	Panhard & Levassor.	1
16.94	7th	30 "	6	" "	1
15.14	10th	3 Oct	51	De Dion & Bouton.	5
14.09	2d	25 Sept.	5	Panhard & Levassor.	4

18 00 average.

The prizes for the Paris-Mantes motorcycle race, which occurred a few days before the Paris-Marseilles, were awarded as follows:

For motorcycles without pedal attachment only one prize, to Hurtu & Diligeon, for their No. 50.

For motorcycles with pedal attachment, four prizes, as follows:

1. No. 52.—Michelin (tricycle De Dion).
2. No. 15.—De Dion & Bouton.
3. No. 51.—Michelin.
4. No. 13.—De Dion & Bouton.

The motor trophy offered by the Motor Car Club was awarded to De Dion & Bouton for their petroleum tricycles. Another trophy, offered by M. Xau, was awarded to No. 8, which accomplished the course with the least interruption.

M. Michelin's special prize of 2,000 francs for the vehicle making the best time was, of course, awarded to No. 6.

Medals of silver were also voted to all the operators and passengers who had accomplished the entire course.

At the exposition which followed the race, and continued open for a week, all the prize winners in the race were in evidence, as well as a number of others.

Peugeot & Co. showed their break No. 46, which won the only prize for vehicles of more than four places, besides their other racing carriage and a vis-a-vis.

The dust and stain of travel was not removed from these vehicles, making them all the more interesting as proofs of the terrible experiences of the contest.

Panhard & Levassor had in addition to their three winners an omnibus and a tourists' wagon, already sold.

A break for six persons and the other souvenir of the race were shown by M. Delahaye, two vehicles by the Maison Parisienne, two Triouleyres carriages, one Landry & Beyroux, two by Michelin, and quite a number of De Dion and Michelin tricycles which gave so good an account of themselves in the race, and two Roger delivery wagons.

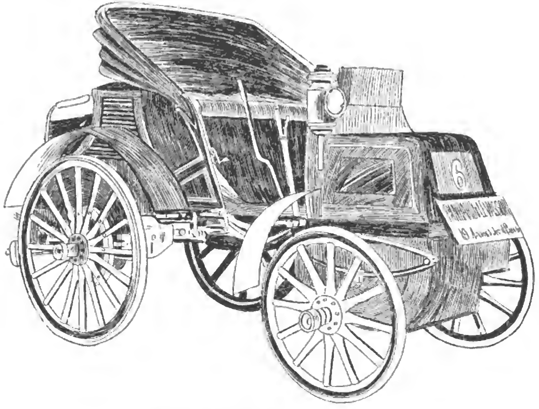
In addition to these there were two tricycles made by Clement & Co., the great bicycle manufacturers; vehicles of Gautier & Wehrle, recent converts from steam to petroleum; a petroleum vis-a-vis by Mars, and a motor carriage and motor tricycle from the Humber factories.

An exhibit of parts was also made by those who are now catering to the new industry, odometers, ignition tubes, lamps, lubricators, burners, springs and axles, castings, wheels, batteries, tires, etc., were shown.

A number of the leading carriage builders showed some of their best styles of vehicles fitted with different motors of the approved kind.

The correspondent of the *Autocar* describing this exhibition gives an able summary of the results of the contest, which we reprint *verbatim:*

"Some idea of the lessons of the trials may be obtained from an inspection of the vehicles as they appear after the race. At present only a few of them are on view at the exhibition in the Palais de l'Industrie, and it is to be hoped that



WINNER OF THE FIRST PRIZE. PANHARD & LEVASSOR.

PARIS-MARSEILLES RACE, SEPT. 24 TO OCT. 4, 1896.

AVERAGE SPEEDS IN MILES PER HOUR.

OUTWARD JOURNEY.			HOMEWARD JOURNEY.			TOTAL JOURNEY.					PRIZES.		
Speed.	Entry No.	Final Order.	Speed.	Entry No.	Final Order.	Speed.	Entry No.	Name.	Vehicle.	No. of Persons.	No.	Class.	Series.
15.58	13	3	17.03	6	1	15.86	6	Panhard & Levassor	Phaeton.	4	1	A	1
15.49	8	2	16.25	5	4	15.76	8	" " "	Omnibus.	4	2	A	1
15.08	44	8	16.02	8	2	15.12	13	De Dion & Bouton	Tricycle.	1	1	B	2
14.84	6	1	14.68	13	3	15.04	5	Panhard & Levassor.	Carriage.	2	3	A	1
14.82	46	6	14.48	42	10	14.61	51	De Dion & Bouton	Tricycle.	1	2	B	2
14.77	51	5	14.45	51	5	14.23	46	Peugeot & Co.	Carriage.	5	1	A	2
14.53	41	7	13.93	41	7	14.22	41	Delahaye	Brake.	4	4	A	1
14.00	5	4	13.67	46	6	13.19	44	Peugeot & Co.	Carriage.	2	5	A	1
12.67	15	9	13.18	15	9	12.92	15	Dion & Bouton	Tricycle.	1	3	B	2
11.33	42	10	11.73	44	8	12.72	42	Delahaye	Dog Cart.	4	6	A	1
11.27	26	13	10.44	29	11	10.66	29	C. P. des V. A.*	Phaeton.	4	7	A	1
11.11	30	12	8.89	30	12	9.89	30	" " " " "	"	4	8	A	1
10.89	29	11	6.00	26	13	7.83	26	Landry & Beyroux	Cabriolet.	2	9	A	1

13.57 Average. 13.16 Average.

* Benz & Co.

the others will soon be added to this interesting collection, as otherwise the information available must necessarily be incomplete. The first thing that strikes one is that the autocars are in a much better state than could have been looked for after such a terribly trying run. If it were not for the mud and dust that covered them it would be difficult to imagine that they had run upward of a thousand miles under the worst possible conditions. The No. 13 tricycle is intact. It is a solidly constructed machine with large tubes, and the front fork is made double. The tubes where they join are strengthened by clamps, and it is only at the bottom bracket where they are simply brazed. That this is a weak point in the petroleum tricycle was seen in the breaking of the tube at this point in the machine ridden by M. Delieuvin in the Paris-Mantes race. Some stability is, however, given to the machine by light tubes which connect the bottom bracket with the bottom of the case containing the motor. The cog wheel connecting the motor with the driving axle is exposed, and this would seem to be liable to be clogged up in muddy weather. The three Panhard & Levassor vehicles also show little signs of wear. They had suffered principally in the tires, which are flat rubber bands apparently cemented onto the wheels. Some of them were cut to pieces, and were fastened onto the rims with iron wire. Evidently, for fast running the tires will need a good deal more attention than has been given them by manufacturers so far, for they are undoubtedly one of the most necessary equipments of the autocar. The iron tire is, of course, the most trustworthy, just like the solid tire on the bicycle, but the inconvenience of the latter is increased tenfold in the iron tire of the autocar. The iron tire is, of course, the most trustworthy, just like the solid tire on the bicycle, but the inconvenience of the latter is increased tenfold in the iron tire of the autocar. This necessity for some good tire is particularly impressed upon one when witnessing the behavior of an autocar when traveling at full speed. If the roads be not perfectly level and smooth, and unfortunately these conditions prevail very rarely indeed, the carriage jumps and vibrates like a torpedo boat at sea, and it is very necessary that some of this motion should be taken up by the tires. It is true that the inconvenience arising from this vibration of the vehicle is more apparent than real, and that the riders themselves do not appreciate it so much as the onlooker, but all the same it is quite enough to make it very desirable that the jumping and the trepidation should be, if possible, entirely suppressed. This, of course, cannot be done by the iron tires, and only partially by the solid india rubber tires. But these latter have proved themselves to be useless for fast running. It seems that the greater the speed of the vehicle the more destructive is the action on the solid rubber tires. Then we have the pneumatic tires, and it must be confessed that these came out best in the race, though only a relative best. Punctures were frequent all through the contest, and a lot of time was lost in repairing them. This is a serious matter for the private owner who has not the skill to properly repair tires himself, and it is not surprising that so many buyers should prefer the solid to the air tires. Apparently the only way to overcome the difficulty is to invent an unpuncturable pneumatic tire. This is a somewhat visionary achievement in the light bicycle tire, but for the autocar a much wider scope is offered to the inventor, and there is really no reason why something should not be done to protect the large carriage tires from puncture.

The only carriages to show any sign of hard usage in the in the Panhard & Levassor group was the No. 5, which, it will be remembered, was overturned, and it is simply surprising how little damage is done to the vehicle. It was traveling at the rate of 25 miles an hour when the carriage collided against a tree in trying to avoid a dog, and yet the only damage sustained are the bending and denting of one or two accessories, such as the lamp, the mud-guards, the brake, and the case containing the motor. This carriage ran remarkably well throughout the race, but the No. 8 caused a good deal of trouble through the extinction of the burners and other little defects that interfered with progress. It is here necessary to rectify a statement made in our last report that the Panhard & Levassor vehicles are fitted with Daimler motors; as a matter of fact, the firm have abandoned the Daimler motor for one of their own design and manufacture. This is a very similar one, being likewise a two-cylinder vertical motor placed in the fore part of the vehicle, and the firm claims that it is lighter and more powerful than the original Daimler. There are some notable changes in the disposition of the motor and in the gearing, of which we hope to be able to give a full description very shortly.

MM. Peugeot & Co. showed their Nos. 44 and 46, the latter securing the first prize for vehicles with more than four places, and neither of them showed much sign of wear and tear. In these vehicles the two-cylinder horizontal motor is placed under the front part of the vehicle, and is geared onto the driving axle by three cog wheels. All the parts are well closed in, and the only difficulty met with by the firm was the continual blowing out of the burners. This indeed caused a considerable amount of inconvenience to nearly all the competitors, and it is evident that this part of the autocar requires a good deal of improvement. Experts are becoming increasingly of the opinion that the firing tube is not nearly so satisfactory as the electrical battery. It is true that the firing tube is more certain and regular in its action and that the electrical battery is liable to cause premature explosions, but this drawback of electricity is more than counterbalanced by other advantages, of which one of the most important is that it can bid defiance to all kinds of weather. Had the gas mixture in the Peugeot carriages been exploded by the electricity, it is to be presumed that they would have shown up much better at the finish, as no time would have been lost in perpetually relighting the burners. The Bollée tandems suffered from the same trouble. The Delahaye carriages came through the race in an eminently satisfactory manner, and there was scarcely a single breakage noticeable, the only thing being the snapping of the step, which had been tied up with string. These are all the vehicles of which an opportunity has been given for close inspection so far, but the exhibition comprises several new autocars, which will be dealt with in our next issue. After such a long run, during which the carriages were driven at their maximum speed, it is very encouraging to find that the autocars have come out so successfully, but there is one point to which attention must be drawn, and that is the tendency of the vehicles to catch up the dust. In a race there is, of course, no time to carefully clean the mechanism of the oil that oozes out on the carriage. The dust is thus caught by the oil, and the vehicles, after a long run, have a very untidy appearance. It smothers the chain and the mechanism, and one's clothes are spoilt by contact with the adhering dust. This, however, is an exceptional case and in private autocars, where the owner is able to give proper attention to the mechanism, the vehicle is in every way as clean and neat as the ordinary carriage. It yet remains evident that makers have every interest in taking precautions to prevent the slightest danger of any overflow, either of lubricating oil or petroleum spirit, and they must make the autocar of the future as little liable to inconvenience from this cause as any other type of vehicle.

"As for the other lessons of the trials, the battle of the motors has again resulted in a striking victory for the vertical engines. It is perhaps inadvisable to attach too much importance to this, for the exceptional conditions under which the race was run hardly afford us entirely trustworthy data. As we have stated before, a race provokes so many accidents that the question of luck enters very largely into the calculations, and had all the competitors been equally favored on this point, it is very probable that the result might have been modified, or at least we should have had something more solid to go upon in estimating the respective merits of the horizontal and vertical motors. An intelligent system of technical trials would throw much more light upon this question than a race of this description. To a certain extent the same thing may be said of steam. This power has had no chance of showing up to advantage, but all the same its utter failure practically means the death-blow of steam. There are only two men who have faith in steam, and these are Count de Dion and M. Serpollet, and they are both convinced that improved engines will soon be invented that will place this power in the rank which it ought properly to occupy for autocar propulsion. Such are the salient lessons to be learned from the Paris-Marseilles race, and if nothing else were possible from this great contest it would yet have fully justified itself."

FOREIGN NOTES.

A firm in Paris is about to manufacture acetylene lamps for motor carriages.

The great chocolate kings Menier were among the subscribers to the Paris-Marseilles-Paris purse.

An exhibition of motor vehicles will be held at the Royal Dublin Society's Buildings, Dublin, Ireland, Jan. 16 to 23, inclusive.

The New Motor Car & Cycle Co. has been organized at Aberdeen, Scotland, to manufacture and sell motor vehicles and cycles in the northern country.

De Dion & Bouton are about to place on the market a new petroleum motor which is said to combine all the necessary qualities.

An English contemporary says it is reported that Palmer's Shipbuilding Co., Jarrow-on-Tyne, have commenced the manufacture of motor vehicles.

H. J. Lawson, the "motor vehicle king," intends to organize a motor race from London to Brighton and return for prizes amounting to $10,000.

The British Motor Syndicate expect to exhibit a number of carriages at the Stanley Cycle Show. The same corporation is advertising a motor delivery wagon in the London press.

A depot has been established in London, where motor vehicles may be repaired and stored. Skilled mechanics, thoroughly posted in motor vehicle work, will be kept in readiness to answer calls from disabled vehicles in any part of the city.

R. Hornsby & Sons, Ltd., of Grantham, England, manufacturers of the "Hornsby-Akroyd" oil engines, are manufacturing an agricultural traction engine on the same principle. This machine is said to be capable of driving a threshing machine, drawing 20 to 25 tons on a level, and 8 tons up an incline of 1 in 16.

The Daimler Motor Syndicate, Ltd., of London, deny the statement made by the *Autocar's* correspondent, that the motor used by Panhard & Levassor in the Paris-Marseilles race, was not a Daimler motor. In further explanation they add that it was an improved Daimler motor, just as they themselves are preparing to put upon the market a motor showing a number of new and improved features, but still a Daimler.

The house of Roger, now become the Anglo-French Motor Carriage Company, refused to take part in the Paris-Marseilles race, on the ground that the conditions were not normal, and they were aiming at economy, simplicity and ease of control rather than excessive speed. The Roger patents have recently been taken up by an English syndicate, with a capital of $1,500,000, who are now entering largely into the manufacture of the Roger motor vehicles at Birmingham, England.

Motor Vehicle Tour to Brighton.

The tour of the Motor Car Club from London to Brighton, in celebration of the rescinding of the restrictions governing the use of motor vehicles on common roads, takes place on Nov. 14.

Harry J. Lawson, president of the club, will drive the leading, or pilot vehicle, which will start at 10.30 a. m. Through the populous centres slow speed in processional order will be the rule, but in the rural districts more latitude will be allowed, and the tourists will be permitted to strike their own pace.

At Brighton a public dinner will be given, after which the participants will return to London by special train.

The secretary of the club offers the following very sensible general recommendations to all owners and drivers of motor vehicles taking part in the tour:

"Remember that motor cars are on their trial in England, and that any rashness or carelessness might injure the industry in this country.

"See that your motor cars appear in thoroughly good clean order, and never left unattended on the route.

"Be fully provided with sufficient lubricating and motor oil.

"See that passengers are provided with proper protection against bad weather, such as mackintoshes, etc., and with light provisions.

"Use the greatest care as to speed and driving, so as not to endanger ordinary traffic.

"Treat the police and other authorities on the route with polite consideration."

The British Motor Syndicate, who claim to be the owners of all the practical motor patents, have consented to waive all rights on this occasion so as to enable possible infringing motor vehicles to take part in the run.

The Olds Motor Carriage.

P. F. Olds & Son, Lansing, Mich., well-known manufacturers of gasolene engines, who have been engaged on a motor carriage for some months, write that they have finally reduced their ideas to tangible shape and find the result quite satisfactory. A photograph of the carriage is appended.

Underneath the box, and in every way independent of it, is a 5-hp gasolene motor, which in operation makes scarcely any vibration.

The vehicle is steered with the left hand. The lever at the right of the buggy, when thrown forward, throws in the back gear; when turned in the opposite direction a fourth of a turn it throws in a four-mile speed, which is used for rough roads and hill climbing. If higher speed is desired another quarter of a turn gives eight miles an hour, still another 12 miles an hour, and if still greater speed is desired the speed is increased at the governor of the motor and as high as 18 miles an hour can be obtained.

The machinery is said to be very simple, not even a countershaft being used in its construction; it is practically noiseless and impossible to explode, as the fuel supply is below the engine. The carriage is fitted with 1½-inch rubber tires and is ball-bearing throughout. It has attracted great interest in the section around Lansing during the past few weeks of daily use on the streets. Long runs have also been made into the country, which were entirely satisfactory.

The inventor is R. E. Olds, general manager of the company, who states that they did not enter for the race at Providence because the rules required that there should be at least five carriages of different makes, which must make an average speed of 15 miles an hour or the race would be declared off, and they were satisfied there would not be as many rigs of different manufacture which would meet the requirements, or they would have been pleased to enter the carriage.

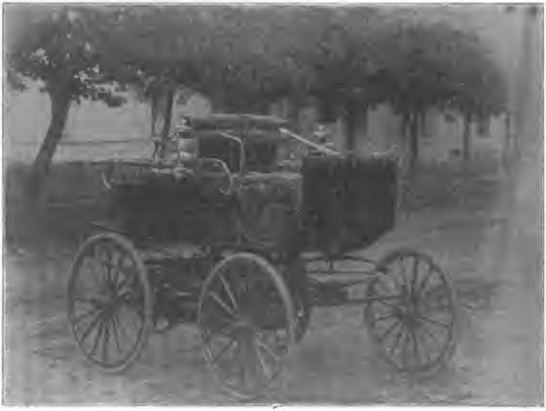
The S. Messerer Motor Wagon Company.

Stephen Messerer, a skilled watchmaker and jeweler of 15 Springfield Avenue, Newark, N. J., is about to embark in the manufacture of motor vehicles.

In the rear of his store he has for some years conducted a model or experimental shop, where inventors' ideas are perfected. Here he is now engaged upon the patterns for his motor, which will have four cylinders, 4 x 6 inches, working separately or altogether, as required by the road and load.

He promises a novel system of cooling the cylinders, by means of which a smaller supply of water will be needed than is usual in gasolene motors of the same power.

The name ot the new company is the S. Messerer Motor Wagon Company, and the first vehicle built will be a pleasure wagon.



MOTOR CARRIAGE P. F. OLDS & SON, LANSING, MICH.

The American Institute Fair.

The annual fair of the Mechanics' Institute, held Oct. 3d to 29th, at the Madison Square Garden, New York, had a new attraction in the motor carriages exhibited by the Daimler Motor Company and the Riker Electric Motor Company.

The Daimler Company showed three models, one built by the parent company at Cannstatt, Germany, and two of the latest productions of the Paris makers, a phaeton from the factories of Panhard & Levassor, similar to the one which was victorious in the Paris-Marseilles race, and an elegant example of the skill of Peugeot & Co.

Besides these excellent examples of the motor vehicle art as represented by its leading exponents abroad, the Daimler Company had on view a two-hp kerosene motor, a very smooth running and handsome engine for stationary work; a fire engine operated by a Daimler motor, though not self-propelling; a Daimler launch and several separate marine motors.

A railway inspection car, propelled by a 2-hp Daimler motor, afforded an illustration of a new application of the gasolene motor in which this company is now interested. This car, which was manufactured at Kalamazoo, Mich,, weighs 500 pounds, so that two men can easily lift it on and off the track, one end at a time. A patent cooling process renders little water necessary. Two speeds, 7 and 15 miles per hour, can be obtained.

For this very commendable exhibit the Daimler Company received a special medal of silver, the highest award.

The Riker Electric Motor Company, of Brooklyn, exhibited the electric trap, which won the first prize at Providence last month. This carriage was very favorably commented on by visitors for its light and elegant appearance, and a medal of superiority was voted the Riker Company by the Committee on Awards.

The Otto Gas Engine Company and the Gas Engine & Power Company were also on the list of successful exhibitors, the former having received a medal of superiority for their improved stationary engine, and the latter an award of like degree for one of their naphtha launches.

The Kulage Motor Vehicle.

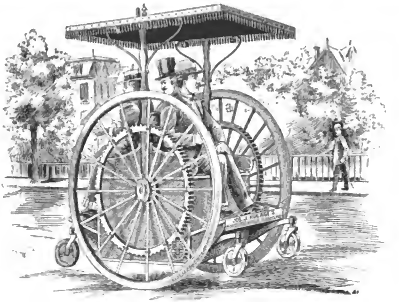
Joseph J. Kulage, 1435 College Avenue, St. Louis, Mo., is the inventor of a motor vehicle, shown in the accompanying cut, which marks a radical departure from those heretofore described in our columns.

Mr. Kulage promises full and detailed information for the next issue, contenting himself for the present with the mention of a few points in which he believes his vehicle is superior. These he enumerates as follows:

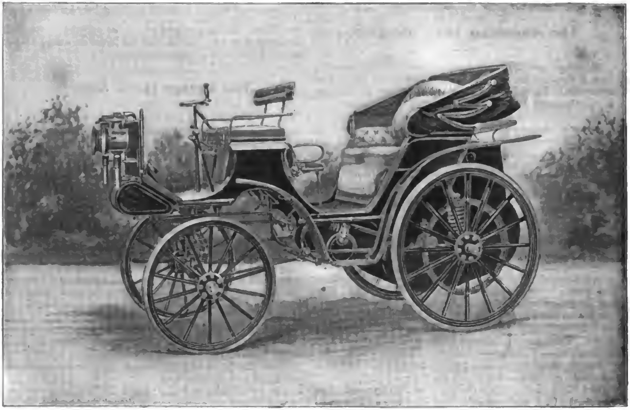
First: Safety.—No matter at what high speed the vehicle may strike an obstruction on the road, or how uneven or slanting the road may be, it cannot be upset or thrown upon its side. Furthermore, supposing the vehicle to be running along at high speed, and only a few feet ahead, a rut or any other danger should suddenly appear, this vehicle can avoid the danger, for no matter how high the speed, it can be turned around instantly and on so small a radius as the distance between its own wheels.

Second: Ease of Control and Manageability.—This vehicle on the road can be stopped, started and turned exclusively by foot power, without the use of even a hand. No guiding, steering or brake levers are required for the hands, which are entirely free.

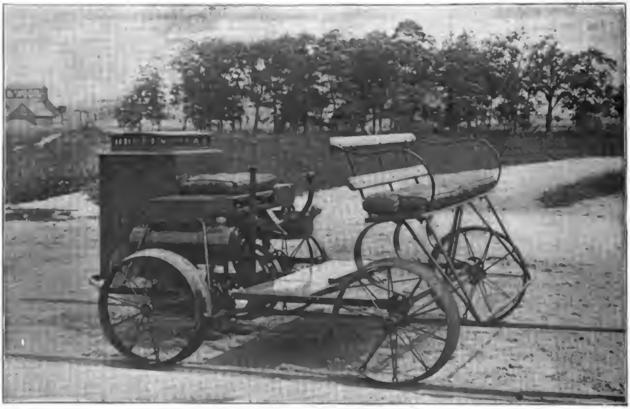
Third: Convenience and Simplicity in Form of Construction and Economy of Operation.—The bottom of the vehicle being below the axles and only about a foot from or as near to the ground as desired, and no obstructions being found in front or rear, the seats (front or rear) can be taken with even greater convenience than in a street car. The scientific principles which underlie the entire construction are claimed to prevent the slipping of the wheels in ascending hills or in



MOTOR VEHICLE. J. J. KULAGE, ST. LOUIS, MO.



DAIMLER CARRIAGE, DAIMLER MOTOR CO., STEINWAY, L. I.



RAILWAY INSPECTION CAR PROPELLED BY DAIMLER MOTOR.

mud or snow, and to enable the propulsion of the vehicle with less power than is required in the ordinary style of motor vehicle.

It is Mr. Kulage's intention to organize a company and begin at once to manufacture these vehicles for the market.

The New York Motor.

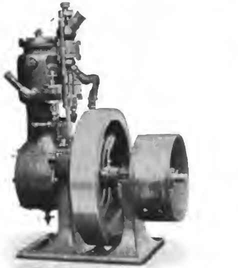
A new light motor has just made its appearance in the New York market, the New York motor, made by the New York Motor Company, 11 Murray Street.

This new motor is very compact (weighing only about 150 pounds, including the fly-wheel), develops 1½ to 2 horse power, and runs either on city gas or gasolene. Several novel and valuable features are claimed in its construction.

The cranks are incased and run in an oil bath, thus keeping perfectly lubricated.

The fly-wheel revolves between two bearings, preventing any spring in the cranks.

An ingenious method is employed to cool the piston and reduce the quantity of water required in the jacket. During the up or compression stroke air is admitted through holes in the crank-box and drawn up into the piston through a clap, being expelled again by the down stroke. This device is said to be so effective that the motor will run 10 hours on 10 gallons of water.



Another improvement found only in this motor lies in the inlet valve, which is so constructed that the new charge is conducted directly down to the piston, and on compression the spark flashes in its very centre, keeping the points of the igniter dry and securing regularity of explosion.

The valve mechanism, which is of the poppet kind, is extremely simple and positive. It consists in reality of one double valve, operated by one cam, one roller and one slide. Both valves and igniter depend on one gear-wheel.

The speed of the motor under a load is about 300 revolutions, which reduces vibration and wear.

Both the electric spark and the hot tube are employed in ignition, the latter being recommended where the motor is required to run from 12 to 15 hours at a stretch for stationary purposes.

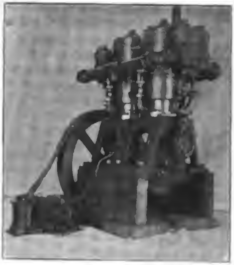
For stationary purposes it is sold with combined base and water tank. For wagons a small rotary pump is used to circulate the water.

The company will soon show a new frictional reversing gear, which they believe will render their motor peculiarly adapted to boats.

Several motors are on exhibition at the company's store, 11 Murray Street.

The Kirkland Gasolene Motor.

W. A. Kirkland, a mechanical engineer, of 160 Ninth Street, Hoboken, N. J., contributes to this issue a photograph and brief description of a small, two-cylinder gasolene motor, built by him in the shops of the Stevens Institute.



The result of four tests, each of four hours' duration, made upon it by Mr. Kirkland and Mr. W. C. Strang, of the Institute, are given as follows:

Average horse-power by Prony brake....	1.47
Average revolutions per minute..........	623
Average consumption of fuel per four hours.	7½ pints.
Gasolene per horse-power per hour.......	1.28 pints.

The weight of the motor is 63 pounds.

Power Storage for Vehicles.

Martin J. DeDonald, of the firm of McCardell, West & Co., Trenton, N. J., has just been granted patents on a device for storing power in vehicles when going down hill, and applying it to propulsion afterward. A power-transmitting gear engages the driving mechanism, and a clutch-controlled gear carried by an accumulator shaft, on which are coiled springs, is in winding connection with the transmitting gear. There is a second clutch connection between the accumulator shaft and the transmitting gear, and a third clutch connection whereby the springs may be wound up by the winding mechanism. The apparatus is particularly adapted for use in connection with velocipedes.

Isaac H. Davis' Motor Attachment for Bicycles.

Bicycle manufacturers who have studied the motor cycle problem, are well aware that the extreme lightness of the machine at present demanded almost precludes the attachment of any motor directly to the frame. Unlike most machinery the modern bicycle is without a factor of safety, and can scarcely be depended on to do more than carry an average rider over an ordinary good road. Hence those who have endeavored to apply a motor directly to the frame have found that the shock and strain of the working motor, with its weight, tended to weaken the frame and render it unsafe.

After many failures in the above direction inventors turned their attention to designing a special type of bicycle, with extra strength of parts to withstand the weight and strain of the motor required to drive it. Some of these bicycles work fairly well, but their weight is so great that they are rather clumsy and difficult to handle, and in case of an accident to the machine, either in the failure of the motor or its supplies, the rider finds it inconvenient to propel it.

To overcome these objections Isaac H. Davis, of Dorchester, Mass., has designed a motor attachment which is really independent of the bicycle, being attachable to and detachable from the frame, without in any way interfering with the action of the pedals.

The attachment, called by Mr. Davis a motor carriage, is connected with the bicycle frame by means of braces. It consists of a driving wheel driven by a motor of suitable construction—steam, gasolene, or electric.

The figure here shown is a side elevation, the bicycle to which the carriage is attached being indicated by dotted lines.

The tubular bar *a* constitutes a reservoir for the inflammable fluid used in generating steam (in the present description a steam engine is assumed).

At the end of the bar is a clamping device fitted around the steering post of the bicycle by means of a sleeve divided into two parts and bolted securely together.

The tube has a flexible spring connection with the steering head.

The tube *a*, is closed at both ends, the lower end being bolted to a water tank *h*, which forms part of the frame supporting the drive wheel *i*.

A curved brace *j* is clamped at *k* to one of the bars of the bicycle frame and also bolted to the end of the tank, from which an additional brace extends to the axle of the wheel.

Thus it will be seen that the whole contrivance forms a very light motor carriage, which may be attached at the right hand side of any standard make of bicycle without hindering the use of the pedals.

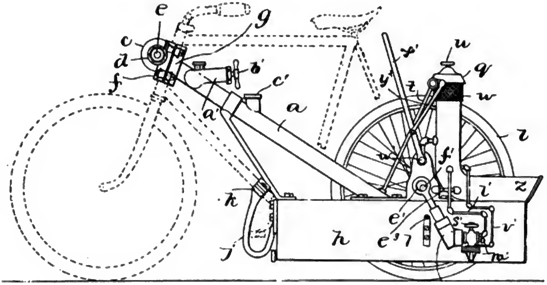
Upon the top of the water tank is a generator, having an inner chamber in which combustion takes place, surrounded by a chamber or coil of pipe in which the steam is generated.

Oil is forced from the tubular reservoir to the generator by means of an air pump always under the rider's control.

The water is forced from the tank through an automatic valve by another pump operated by an eccentric on the engine shaft.

This pump is controlled by the rider through an adjusting screw, which regulates the flow of the water to the requirements, stopping it altogether when it is desired in starting to quickly bring the steam chamber up to the proper temperature, and increasing it to the limit for hill climbing.

The automatic valve, however, renders the use of this screw unnecessary in most cases.



MOTOR ATTACHMENT FOR BICYCLE. ISAAC H. DAVIS, DORCHESTER, MASS.

The engine or motor is mounted upon the water tank, and connects with the drive wheel of the carriage.

In starting the machine the first operation is to put the oil in the tube under pressure through the air pump, and then when it is forced up to the burner in the generator, ignite it. The oxygen of the air uniting with the flame causes an intense combustion in the combustion chamber, and the oil is transformed into gas before it enters the chamber, and the water in the steam chamber flashes into steam and passes into the engine to operate it.

When the proper pressure is reached the regulating screw is turned and the water will then be injected in proper quantities into the steam chamber, where it will be instantly converted into steam. Thereafter the water flows back and forth from the tank to the pump, according to the pressure.

When the rider wishes to dismount he shuts off the steam from the engine and opens the exhaust by means of the lever.

The braces and connecting rods are all so arranged that the carriage is easily adjusted and adapts itself readily to the ground. To provide against the side thrust that would be felt if the driving wheel were made parallel with the bicycle wheel, the former is placed at a slight angle, so that the two wheels converge to a point in the rear.

All the controlling levers and handles are within easy reach of the right hand.

Mr. Davis is making improvements in his invention, and promises the readers of The Horseless Age particulars about them at an early day.

MINOR MENTION.

A. McIntosh Williamson, 2204 Fitzwater Street, Philadelphia, Pa., has applied for a patent on a vehicle tire which he is confident will meet the needs of motor vehicle builders.

The Weston-Mott Company, manufacturers of bicycle wheels and parts, are soon to remove from Jamesville to Utica, N. Y., where they will have increased facilities. This concern is prepared to furnish wire wheels for motor vehicles.

Stucky & Heck, 35 New Jersey Railroad Avenue, Newark, N. J., are specialists of high standing in the electric-motor line. They undertake the construction of all kinds of motors, including such as are found most serviceable for electric vehicles, and guarantee satisfactory performance.

The Hercules Seamless Drawn Tube Company have completed their plant at Garwood, N. J., and are now busily engaged in filling orders for all kinds of seamless steel tubing, manufactured of the best raw material and under improved methods. The company will make a specialty of grades and sizes suitable for bicycles and motor vehicles. New York offices have been opened in the Postal Telegraph Building, 253 Broadway.

In addition to their complete line of ball bearings the Ball-Bearing Company, of Boston, Mass., is now furnishing an improved roller bearing, which is being successfully applied to wheels and motor-bearing parts of motor vehicles. The Electric Carriage & Wagon Co., of Philadelphia, are equipping their new line of hansoms to be operated in New York City with these roller bearings as well as with ball bearings. In the roller bearings the balls are contained in cages similar to those used with the company's ball bearings, and the rolls are guided in exactly parallel lines, so that the rapid wear and other defects usual with the use of rolls are entirely avoided. The bearings are self-contained, readily applied, and are said to effect a saving of from 50 to 90 per cent.

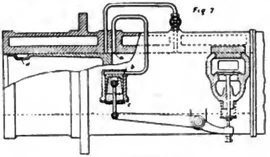
Gas Engines.

BY GEO. RICHMOND, M. E.

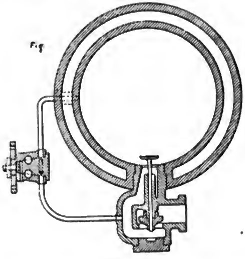
(Continued.)

At the proper moment for opening the exhaust valve the cylinder is filled with waste gases under considerable pressure. Advantage has been taken of this fact by a number of inventors and the pressure utilized to operate the exhaust valve.

One of Otto's arrangements is shown in Fig. 7. At the end of the expansion stroke, the port *a* being uncovered, the gases rush into the cylinder *b* and force down the plunger *c*, thus lifting the exhaust valve against its spring by means of the lever shown. The port *a* being quickly closed by the return of the piston, the gas is shut off from returning and holds the exhaust valve open. At the end of the return stroke the port *d* in the piston puts the port *a* in communication with the waste pipe *e* and the valve is brought down by its spring. On the next forward stroke of the piston, the mixture in the cylinder being at atmospheric pressure, is insufficient to move the plunger *c*, and the exhaust valve remains closed. Fig. 8 shows the Lanchester method of doing the same thing. In this case the waste gases act directly on the exhaust valve stem through what may be termed an over-balanced equilibrium valve. The connection with the cylinder is controlled by a conical cock actuated by a ratchet wheel, which is operated from the crank shaft. The ratchet wheel is revolved one tooth for each revolution of the engine, and each second tooth puts a hole in the plug in line with the piping.

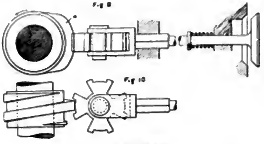


ONE OF OTTO'S DESIGNS.



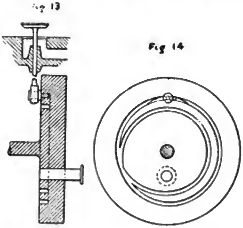
THE LANCHESTER METHOD.

The same inventor has arranged for a two-cylinder engine which dispenses with all mechanism, the exhaust valves being actuated in a manner similar to that to be found in the steam moved valves of a duplex pump.



THE ROOT ARRANGEMENT.

A singular arrangement by Root is shown in Figs. 9 and 10. The crank-shaft carries a worm, the thread of which is enlarged at *a* to form a cam. This worm gears with a worm-wheel fixed at the end of the valve stem. At every second revolution the cam gears into the raised tooth of the worm-wheel and pushes the valve open. On the next revolution it drops into the lower tooth and fails to move the valve. Figs. 13 and 14 show the method adopted in the Daimler motor of

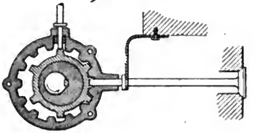


DAIMLER MOTOR METHOD.

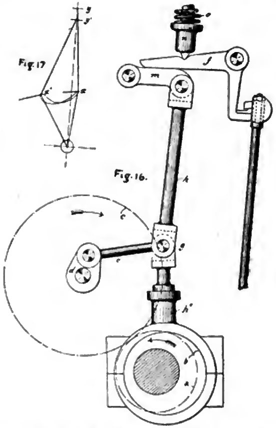
deriving the valve motion directly from the crank disc. For one revolution the shuttle follows the inner circle and the valve is not acted upon. On the next revolution the shuttle turns out into the outer groove and the valve is lifted off its seat.

This outer groove is not very correctly shown in the sketch, it being really a flat cam with the rise extending for somewhat less than a semi-circle. On the next revolution the shuttle re-enters the inner groove and so on. A somewhat similar arrangement is of the differential hoist. Every alternate revolution the inner wheel, which is keyed to the crank-shaft, presents a tooth to the valve stem, and pushes it forward, thus opening the valve. On the next revolution a space is presented, and the valve stem is not operated upon. Two rods at right angles can be operated by the same inner wheel, from which motion suitable for both suction and exhaust valves can be delivered.

Fig. 15.



When gearing is used, all the work (which is considerable) of opening the exhaust valve is thrown upon a few teeth. An ingenious method of obviating this is shown in Figs. 16 and 17 and used on the Grob engines. The two-to-one gear is used, not to operate the valve, but to determine the action of an



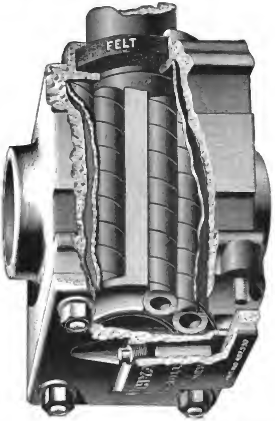
eccentric which really actuates the valve. The connecting-rod is jointed at *g*, and on one revolution the toggle *e* straightens it and enables the eccentric to operate the valve. On the next revolution it draws the joint of the connecting-rod away to x_1 in Fig. 17 and the eccentric fails to lift the valve. Thus the real work of lifting the valve is done, not by the gear wheels, but the eccentric.

Other combinations might be shown for actuating the valves of a gas engine, and many modifications will at once suggest themselves. Those given, however, fairly cover the field, and the ingenious mechanic should have no difficulty in selecting and adopting a means suitable to his immediate purpose. He should be warned, however, that mere ingenuity in devising something new is of less value than correct judgment in selection. Above all, a new combination should be thoroughly tested on a model before building in any quantity, for it frequently happens that the most promising device turns out to be very objectionable, either on account of noise or unequal wear, or from the more serious drawback of being unelastic; that is, not susceptible of adjustment.—*Machinery.*

New Hyatt Roller Bearing for Street Cars.

The accompanying cut shows the method of applying the Hyatt Roller Bearing to a street-car axle.

A lining of sheet steel with a spiral joint is slipped into the box and a similar but smaller sleeve is placed over the axle. The rollers travel between these sleeves, which obviate the necessity for a specially finished surface on the journal or on the box, and form a wearing surface much more durable than wrought or cast iron.



These bearings have proved most satisfactory in service, and the Hyatt Company are taking large orders for them.

◆

Francis H. Richards, the well-known mechanical engineer and patent expert, of Hartford, Conn., is deeply interested in the motor vehicle question. He believes the displacing of the horse will be attended with great public advantages, chief among which will be the saving of room and the greater cleanliness of streets.

◆

George H. Drew, 957 Exchange Building, Boston, Mass., is a firm believer in air as the proper motive force to propel carriages. He is now engaged in designing a motor on this principle, details of which he promises for a later issue.

Recent Patents on Gas Engines, Motors, Etc.

569,175. *Motor Vehicle.* James M. Cook, Mount Gilead, O. Filed Feb. 7, 1896. Serial No. 578,365.

569,343. *Vehicle.* Moses Mishel, Gloversville, N. Y. Filed Dec. 17, 1896. Serial No. 572,486.

569,365. *Gas Engine Starter.* Christian J. Weinman and Edward E. Euchenhofer, Dayton, O., assignees to the Dayton Gas Engine & Manufacturing Company, same place. Filed July 15, 1896. Serial No. 599,212.

569,386. *Gas Engine.* Fred C. Olin, Buffalo, N. Y. Filed Feb. 11, 1893. Renewed March 13, 1896. Serial No. 583,134.

569,460. *Carburetor.* Chas. W. Ingraham, Heppner, Ore., assignee of one-half to Harry Warren, same place. Filed Dec. 27, 1895. Serial No. 573,443.

569,530. *Gas Engine.* Henry A. Winter, Grand Rapids, Mich., Assignor to the Sintz Gas Engine Company, same place. Filed June 24, 1895. Serial No. 553,897.

569,564. *Gas Engine.* Fred C. Olin, Buffalo, N. Y. Filed Aug. 7, 1894. Serial No. 519,628.

568,814. *Gas Engine.* Gustav A. Thode, Osmond. Neb. Filed Jan. 29, 1896. Serial No. 577,238.

568,842. *Petroleum Vapor Burner, with Overheater.* Ludwig Dürr, Bremen, Germany. Filed July 8, 1893. Serial No. 479,931.

568,944. *Device for Charging Hydro-Carbon Gas Generators.* Arthur B. Griffen, Verona, N. J., assignor to the Gilbert & Barker Manufacturing Company, Springfield, Mass. Filed Jan. 22, 1895. Serial No. 535,769.

569,013. *Power-Transmitting Mechanism.* George J. Altham, Swansea, Mass. Filed Oct. 8, 1895. Serial No. 565,009.

569,918. *Gas Engine.* Henry C. Hart, Detroit, Mich. Filed May 31, 1894. Serial No. 513,061.

570,203. *Gear for Motocycles.* George H. Ellis and John F. Steward, Chicago, Ill. Serial No. 576,543.

570,263. *Combined Gas and Steam Engine.* Ransom E. Olds, Lansing, Mich. Filed Aug. 13, 1895. Serial No. 559,160.

570,376. *Discharge Valve for Gas Engines.* William Burger, Delphos, O. Filed Sept. 10, 1895. Serial No. 572,065.

570,395 and 570,396. *Vehicle Driving Gear.* Frank M. Haviland, New York, N. Y. Filed Sept. 16, 1895. Serial No. 562,660.

570,439. *Engine.* Edward J. Pennington, Mount Carmel, Ill. Filed July 21, 1892. Serial No. 440,771.

570,440. *Motor Vehicle.* Edward J. Pennington, Chicago Heights, Ill., assignor to the Motor Cycle Co., Chicago, Ill. Filed March 21, 1893. Serial No. 467,044. Patented in England Dec. 11, 1895. No. 23,771.

570,441. *Motor Vehicle.* Edward J. Pennington, Cleveland, O. Filed Feb. 6, 1895. Serial No. 537,676. Patented in England Dec. 11, 1895. No. 23,771.

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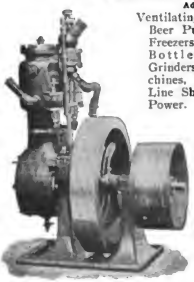

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